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SCIENTIFIC REVIEW
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A RECORD OF PROGRESS IN
ARTS, INDUSTRY, AND MANUFACTURES.
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

JULY 1, 1876.

THE FOURTEENTH ANNUAL GENERAL MEETING OF THE INVENTORS' INSTITUTE.

That the Inventors' Institute has attained the term which, according to the laws of this country, completes the life of a patent—fourteen years—is a noteworthy fact. Established at a time when some men of no mean social status openly advocated the sweeping away of Patent Rights altogether, thus depriving inventors of all legal claim to property in their own intellectual work, it has gone on without the aid of pecuniary wealth, always combatting the Anti-Patent Law party, and yet pressing on to secure, if possible, amended Patent Laws; for the first of these objects gaining no mean advantage, insomuch that the confident assertions of that party have now become toned down into suggestions of mere doubts as to the correctness of the policy of our Patent Laws, and for the second of these objects securing the assent of a large majority of those who recognize the value of industrial progress. Further, the Institute has provided means for inventors to bring their inventions before the public in a way that is likely to benefit those inventors who cannot afford in the first instance to resort to the expensive systems of giving publicity to new ideas which are now so much in vogue.

On the 20th of May the Fourteenth Annual General Meeting of the Institute was held at 4, St. Martin's-place, Trafalgar-square, when—in the unavoidable absence of Sir Antonio Brady, President—the chair was taken by Admiral Selwyn, R.N., one of the Vice-Presidents. The minutes of the last General Meeting having been read by Mr. Campin, the Secretary, the same were passed and signed by the Chairman, who delivered a brief address, stating that at such an important epoch the business of electing officers, reviewing the work of the Institute, and making regulations for its good management, could not possibly be overrated. The Report of the Council was then called for, and was as follows:—

REPORT.

Our Annual General Meeting has again to be held at a time when Parliamentary action is being taken on a Bill professing to amend the Patent Laws—in reality, a measure for their practical annulment.

As probably you are all well aware, the Lord Chancellor has again presented to the House of Lords his Patent Bill, now known as the Patents for Inventions Bill (1876).

This Bill may be said to be an echo of that of last year, being in many points identical with that measure in the form in which it last appeared before the House in the session of 1875.

It differs principally in the provisions in regard to specifying the invention, for, whereas the Bill of last year unmistakably required a full specification to be deposited on the first application for Letters Patent, the new Bill requires a specification describing simply "the nature of the invention" to be then deposited. And these words ("*the nature of the invention*") are the same as those used in the Patent Law Amendment Act (1852) to define the qualities of a *provisional* specification, it is assumed that a document tantamount to a provisional specification is all that is now required in the first instance, and that this document it will be the duty of the examiners to bring into such a shape as that it will be a sufficient specification of the invention to satisfy all practical legal requirements. The Bill is, however, on this—as on many other points—so vague and indefinite, that such a view of the matter may be considered as simply conjectural. Another point in which the Bill differs from that of last year is that now the examination is not to take place till the "notice to proceed" is given, and this may by some be deemed a slight improvement, because the inventor will thus have time to prepare himself for objections on the part of the examiners.

Consequent, as it would seem, upon these modifications, we have in the Bill additional complications in the forms of procedure to obtain patents, there being *two more notices to proceed* and a *request for sealing* before the patent can be obtained; and as all these formalities will have to be taken in accordance with rules to be made by the Commissioners, it is impossible to say how many new pitfalls (into which the inventor and his invention may be engulfed, and from which he will not be released without being deprived of his invention) are thus to be prepared for him. In other respects the new Bill is open to all the old objections. It provides for compulsory licenses and use of patent within too limited a period after the date of patent, continual references to the Lord Chancellor on points of practice, and power to the Commissioners to require the *deposit of models in all cases.* There is no proposition for reduction of cost of obtaining patent, whilst various provisions of the Bill tend to increase the cost.

This having been found to be the character of the Bill, it was suggested by Sir Antonio Brady, our President, and Admiral Selwyn, Vice-President, that the same course of action against the Bill as was taken last year should be adopted this; and, in pursuance of this suggestion, a preliminary Conference was held in March last, at 110, Cannon-street, when the Bill was carefully considered, and the following suggestions as to the Bill were agreed to:—

"That the Commissioners ought to be persons specially qualified for the office by their knowledge or attainments, and able to devote their whole time to the work."

"That the number of examiners and assistant-examiners should be such as the Lord Chancellor, or the Commissioners, with the Treasury, from time to time directs; having regard to the work to be done."

"Word '*provisional*' to be inserted (in clause 7) before specification."

"That in clause 10, sub-section *d*, which stands thus: '*Whether, by reason of the frivolous character of the invention, it is not worthy of a patent,*' be struck out."

"That the annexation of and publication of reports of the examiners are objectionable."

"That the six months' provisional protection commence only after all Patent Office requirements are fulfilled."

"That no person should be allowed to petition the Lord Chancellor against the 'sealing' of a patent unless he be a person having an interest in the matter."

"That clause 15, as it stands in the Bill, would annul the provisional specification."

"That the term for patent should be 21 years."

"That no other fees should be charged than those payable on granting, provided that no more than £10 be the total fee, and that provisional protection be obtainable for £1."

"That, as to clause 19, term of application should be altered to twelve months, and cesser should not apply to colonies."

"That paragraph 5, clause 21, be altered, so as to allow any necessary and proper alteration of title or description of invention."

"That clause 22 should not permit of revocation of patent, except on proof of prior publication and commercial user."

"That clause 26 is most objectionable. No compulsory licence, unless on the basis of a per centage of manufacturers' profits, can be sanctioned by inventors."

"That clause 32 is highly approved of, in so far as it renders the Crown liable for the use of a patent, but objected to as regards the power of the Treasury, which would not be a good or fair judge of what should be paid. All remuneration should be dependent on the use of the invention by the public."

This preliminary conference was followed up by a public one, held at the Hall of the Society of Arts on 25th April last, when the following resolutions were agreed to:—

"That the truest and highest public policy requires that inventors and their inventions should receive the protection and encouragement of the State."

"That this protection should be placed on the same basis as the protection given by law to all other property, acquired or created."

"That the encouragement should be, first, by correct registration of all inventions in the Patent Office; secondly, by free access for inventors to the examining staff and their records; thirdly, by lowering of the cost of protection, so as to bring such protection within the reach of every working man."

"That the only method by which an inventor ought to be rewarded, is from the pecuniary results of his invention for a limited period, and not by State rewards."

"That the Bill on the Patent Laws now before the House of Commons fails in many points to recognize the important bases set forth in the foregoing resolutions, and therefore requires modifications in accordance with such resolutions; and it is hereby referred to a committee to settle the same, and take action accordingly; said committee to consist of same persons who attended the conference at Sir A. Brady's in March last, and such persons attending the present conference as may desire to serve thereon."

Pursuant to the last of these resolutions, the committee thereby constituted was called together on May 9th, when they agreed to present a petition to the House of Commons, embodying these resolutions, and praying that the Bill be not passed, unless modified in accordance therewith. It was agreed that Mr. Sampson S. Lloyd should be asked to present this petition, and ask that it should be read at the table of the House.

Passing from the great question of the Patent Laws, we now turn to the other business of the Institute, the most prominent being the Members' Meetings. These have been quite equal to the average.

The papers read were as follow:—

By the Secretary, "On the Position and Prospects of the Patent Question."

By Mr. T. Morgan, "On Appliances for Railway Safety."

By Mr. F. W. Campin, "On Trade Mark Law."

By Mr. H. A. F. Duckham, "On Lighting Railway Trains with Gas, including Regulators."

By Mr. Henley, on his "Improved Unshipping Rudder."

By Mr. R. Bevan, "On some New Improvements in Obtaining and Applying Motive Power."

The number of papers was reduced to a minimum in consequence of the necessity the Council felt to exist that the time and attention of the Institute should as far as possible be devoted to the Patent Law question; hence many evenings that would have been occupied by reading papers and taking discussions thereon have been thus occupied. Two of the papers, however, which have been named are noteworthy; that by Mr. Duckham, which was very interesting, and was delivered to a crowded meeting; and that by Mr. Morgan, which had reference principally to an invention of Mr. Ford, of Reading, for the mechanical operation of the home and distant signals of railways and the locking of the points and switches, which invention has since the reading of the paper been so far recognised that the Great Western Railway Company has determined that it shall be tried on that railway.

Last year the Institute was called upon to enact some new rules. These have now been in operation for a year, and, making allowance for the difficulty of bringing anything new into successful practice, we cannot say that they have worked unsatisfactorily. The Executive Council have, however, carefully gone through them and consider them substantially right. Under these rules, however, you have now to elect *one-third*, that is, four, of the Executive Council, and you may re-elect the old members thereof. It so happens that two of the old members have resigned, namely, Mr. Carttar and Mr. Whitehouse. There is, therefore, no necessity for more than two of the members now serving to retire; and if we take the usual rule that the oldest should retire, these will be Mr. Bessemer and Mr. Siemens; and these are eligible for re-election.

With regard to the accounts, these have been prepared by the accountant; but, owing to there being now—in consequence of Mr. Carttar leaving the country—no auditor, they have not been audited.

The total number of members being now above 500, it is with regret that the Council have to observe that a very large proportion do not pay up their subscriptions. We trust that the members will see that the great work the Institute is doing to maintain and improve the Patent Laws is worthy of their support; and, further, that this work cannot be carried on without monetary assistance; and that they will endeavour to bring other persons interested in inventions to support the Institute by becoming members.

This report, having been read, was then received and adopted.

The balance-sheet, as prepared by the accountant, was then read by the Secretary, and, there being no auditor, was ordered to be brought before the Executive Committee for examination.

[This balance-sheet can be inspected by any member on application to Secretary.]

ELECTIONS.

Sir Antonio Brady, to be President of the Institute. Moved by Admiral Selwyn, seconded by Mr. F. W. Campin, and carried unanimously.

Messrs. Bessemer and Siemens to be added to the list of Vice-Presidents. Moved by the Chairman, seconded by Mr. F. H. Varley, and carried unanimously.

That Mr. F. W. Campin be Secretary for the year ensuing. Moved by Dr. McGrigor Croft, seconded by Mr. A. J. Murray, and carried unanimously.

The election of the other members of the Executive Council and General Council, including the Vice-Presidents, was then proceeded with, and, including the new Members, the result was as follows:—

President—Sir Antonio Brady.

Vice-Presidents—The Right Hon. the Earl of Caithness; the Hon. Algernon Egerton, M.P.; Sir Thomas Fairbairn, Bart.; Beresford Hope, Esq., M.P.; His Grace the Duke of Manchester; Robert Richardson, Esq., C.E.; Admiral Jasper Selwyn, R.N.; Sir Fothergill Cooke; Cromwell F. Varley, Esq., F.R.S., &c.; Henry Bessemer, Esq.; C. Williams Siemens, Esq., C.E., D.C.L., F.R.S.

Executive Council—Together with the President, and the above-named Vice-Presidents, to consist of Messrs. F. H. Varley, C.E.; — Allardyce; W. H. Barlow, C.E., F.R.S.; S. Calley; F. W. Campin, F.R.S.L. (Sec.); Dr. J. McGregor Croft; Captain Fairholme, R.N.; D. J. McLauchlan; Thomas Morgan; A. J. Murray, C.E.; T. Paterson; Fred. Ransome, C.E.; A. Sweet; M. Zingler.

General Council—Together with the above-named (*ex officio*), to consist of Messrs. Alexander Allan, C.E.; P. W. Barlow, C.E., F.R.S.; M. P. W. Boulton; Samuel Chatwood; D. K. Clarke, C.E.; Dr. Robert H. Collyer, F.C.S; Samuel Courtauld; H. C. Coulthard, C.E.; Robert Davison, C.E.; William Dempsey, C.E.; John Farmer, C.E.; J. Faulding, C.E.; C. Finzel; H. A. Fletcher, C.E., F.R.A.S.; M. M. Harris; G. W. Hemans, C.E.; W. T. Henley; Alexander Mitchell Innes; W. Mitchell Innes; Dr. H. C. Jennings; Dr. P. W. Latham, M.A.; Edward Lord; Walter Macfarlane; Colin Mather; John Mackintosh; George Frederick Muntz; A. Normandy; J. J. Parkes, C.E.; W. H. Preece, C.E.; T. W. Rammell; John Ramsbottom, C.E.; John Saxby; A. Sedley; E. Sonstadt; Berger Spence; Robert Wheble; W. N. Wilson.

Votes of thanks were passed to

The President, and other Officers;
The Executive Council;
Readers and Contributors of Papers; and
The Chairman of the day.

After these had been duly responded to, the Meeting terminated.

NOTE.—The Petition to the House of Commons referred to above was duly presented by Mr. S. S. Lloyd, M.P., and read at the table of the House.

The Patent Bill has several times been placed on the notice papers for further stages, but up to the time of going to press has not been proceeded with.

NEW PATENT OFFICE RULES.

The new rules come into operation on July 1, 1876, whereby—

1. The applicant for Letters Patent will no longer be required to deliver an abridgment of his provisional or complete specification.

2. The extra copy of drawings (if any) required by former rules to be left at the Patent Office, with provisional, complete, or final specification will have to be made in accordance with the following directions:—

"The extra copy of drawings must be made on good white smooth-surfaced drawing paper, of the same dimensions as the parchment or original drawing. All the lines of the drawing must be absolutely black, Indian ink of the best quality to be used, and the same strength or colour of the ink maintained throughout the drawing. Any shading must be in lines, clearly and distinctly drawn, and as open as is consistent with the required effect. Section lines should not be too closely drawn. No colour must be used for any purpose upon this drawing. All letters and figures of reference must be bold and distinct. The border line of the drawing to be one fine line only. This drawing must not be folded, but must be delivered at the office of the Commissioners either in a perfectly flat state, or rolled upon a roller, so as to be free from creases or breaks. In all cases where the original or parchment drawing is coloured, there must be left, in addition to the above copy, another copy coloured."

Reviews.

REYNOLDS' GEOLOGICAL ATLAS.

"Reynolds' Geological Atlas of Great Britain." London: James Reynolds, 174, Strand.

THE maps of this work comprehend an initiatory one of England and Wales, followed by one of each of the English counties, and concluding with a folding map of Scotland. We find a useful page at the commencement of the book, being a geological reference with twenty-eight colours, showing those of the different formations in the maps. We have seldom seen maps better coloured. Students and scientific men have reason to be grateful to this publisher for the excellent compendium which he produces. It is, of course, impossible to state with truth that geological science is easy; still it is now placed in a thorough and concise way, at the same time with so little trouble in reference that persons who have been at all accustomed to study would suppose with some justice that they could obtain a reasonable knowledge of the subject in a very short time. In addition to the geological structure of Great Britain, the mineral products, and agricultural geology and water supply, there is a tourists' guide to the principal places of interest in England and Wales.

To show the character of the descriptions, we will take notice of the account of one county—Surrey—that is to say, as to the geological structure. The chalk hills and the contents and constitution of same,—then the green sand,—are mentioned. The wealden extending so much through the county consisting of a series of clays and sands, with limestone, grit, and shale follows; next Hastings sands. Up to 1720 Sussex was the principal seat of the iron manufacture in England, the ore being obtained from the wealden formations. However, the manufacture was removed to places where coal was more abundant. The said wealden is remarkable for its remains of gigantic reptiles, &c. In about fifteen lines all this information is conveyed. The section of geological structure is illustrated with woodcuts, principally showing the different beds and formations.

TWINING'S LECTURES ON SCIENCE.

"Science made Easy." A series of Familiar Lectures on the Elements of Scientific Knowledge most required in Daily Life. Prepared in connection with the Twickenham Economic Museum, for delivery at popular Institutions, for the use of Schools, and for Home Study. By THOMAS TWINING, author of "Technical Training," &c. Parts 1 to 4. London: Chapman and Hall, 193, Piccadilly. 1876.

MR. TWINING is so well known as an efficient worker on behalf of education in science as regards its practical application to every-day life, that everyone will be prepared to learn that these works are of great educational value. Few persons, however, could have expected to find them so thorough and complete as educational instruments as they really are. In fact, any two persons possessing a modicum of scientific knowledge, can one take the book and read whilst the other exhibits the experiments; and provided the latter has previously rehearsed his part there seems to be no reason why the reading should not be as successful as lectures usually are when given by regular professors of science.

These works must be considered satisfactory in every way, for the matter is satisfactory, the paper is good, the print large and clear, and, in short, no pains or expense has been spared to render these books a test of the value of science made easy in an educational point of view.

The selection of subjects and illustrations range over nearly the whole field of experimental science.

HOWELL ON THE LABOUR LAWS.

"Handy-book of the Labour Laws: being a Popular Guide for Workmen." By GEORGE HOWELL, late Parliamentary Secretary to the Trades Unions of Great Britain. London: H. W. Foster, 14, Fetter-lane, E.C. 1876.

MR. HOWELL puts forth this work as one intended for the instruction and guidance of the working classes; but we are disposed to think that it may be found useful even by the legal man; not certainly as superseding the use of more elaborate legal treatises in regard to difficult points of the law, but as affording for general purposes a comprehensive view of the labour laws; and we are quite sure Employers of labour will find it a very useful book of reference, for although Mr. Howell is ranged on the side of the workmen, he is so careful to avoid incorrect statements, and shows so much impartiality in dealing with the interests of masters, that his work may be relied upon as one that gives a true view of the law in all its practical bearings, with all the necessary information as to legal procedure, especially in regard to the County Courts, which will doubtless be the tribunals where many of the labour cases will be litigated.

As a voucher for the legal soundness of Mr. Howell's work, it may be mentioned that it has been submitted to the revision of barristers of eminence, and, certainly, as far as we can judge (even using legal acumen in forming a decision), is worthy of the confidence of all who wish for information on the labour laws.

REVIEWS POSTPONED.

WE are compelled to postpone reviews of the following works:—

"Man: Palæolithic, Neolithic, and several other Races, not Inconsistent with Scripture." By Nemo. Dublin: Hodges, Foster, and Co., Grafton-street. 1876.

"The Moon: and the Condition and Configurations of its Surface." By Edmund Neison, Fellow of the Royal Astronomical Society, &c. London: Longmans, Green, and Co.

"The Moon and the Earth." By J. M. Reade, C.E., F.G.S. London: Hardwicke and Bogue.

"The Secret of the Circle: its Area Ascertained." By Alick Carrick. London: Sotheran and Co.

"The Mechanical Action of Light." By Dr. Crookes, F.R.S., &c.; and "Former Speculations." By O. Reichenbach. London: Printed by Taylor and Francis, Red Lion-court, Fleet-street. 1876.

"Two Planets Beyond Neptune, and the Motion of the Solar System." A Speculation. By O. Reichenbach. London: Wertheimer, Lea, and Co.

NEW MILITARY MACHINE.

A VERY handsome machine or instrument for learning military drill and tactics has been recently introduced by Messrs. Clowes and Sons, Military Publishers, Parliament-street. There are two boxes about the size of large writing desks; the one for cavalry, the other for infantry. The cavalry contains two drawers, each full of tin troopers, making a regiment, and the officers. The men are placed on mahogany platforms, and worked by turning any of the wheels with the fingers; so they wheel in fours, in contra-distinction to the old threes, which, with the light infantry drill they are superior to the present system by some of the military, dating since 1830, but previous to recent years. But not only this, every evolution is beautifully and simply worked by the turn of the wheel. It leaves the spaces in front when wheeling fours, and the angles are well described. The beauty of cavalry movements is well shown. With the printed directions, which are in a small compass, and the ordinary manuals, a valuable and speedy aid in learning is afforded. The officers are not like the men, permanently fixed, but are on little blocks, and are placed in front of them. The infantry soldiers are moveable, and may be fixed on little brass pegs. The officers of cavalry include troop guides, troop leaders, troop serrefile, squadron leader, colonel, major, adjutant, right wing marker, left wing marker, brigadier, and brigade-major. The stand of each figure is a small serrated wheel. The points interlock right and left; a line of such wheels passes down between the front and rear rank figures—interlocking—in order that both ranks may be turned at the same time. Though the infantry are moveable, they are similarly turned by wheels. The cost of the invention is £10 for the cavalry, and £6 6s. infantry. Captain Podmore Clark, late of 52nd Regiment, is the inventor, and Messrs. W. Clowes and Sons are the purchasers.

PUBLIC STREET DIRECTORIES.

MESSRS. PEARCE, LEVER, and Co., of Fleet-street, have recently put forward the above means of reference in a simple, yet very ingenious form. Reference of the kind has been a serious want in towns like London, where there are so many courts and such a great number of people living in one street or having their offices or places of business there in all kinds of corners. It is curious that we go on for so many years in patient want when remedies turn out so easy; that so to speak a person who could be of the greatest assistance to us and is willing to afford it is living next door, and yet for twenty years we have not taken the trouble to ascertain his name. We believe there are many useful inventions like the one we are about to describe, which should be made, and would be as simple. The directory is intended to be fixed on four to ten lamp-posts in each street, and surrounds it in an angular case, which, if the post were fifteen feet in height, would rise to about three and a half feet. Each panel is to contain a slip of zinc with a white paper face, made weatherproof. Upon the face of these slips are the names of the firms trading in the streets, and their addresses arranged alphabetically. (2.) The names of the various streets and courts leading from the street, with the numbers nearest upon which they abut arranged alphabetically; also information as to the nearest postal and telegraph offices, railway, fire and police stations, doctors, &c. The directories will accommodate 300 to 400 names, and those on lamps will revolve. The frame, which is of elegant design, supported by mermaids, contains six or eight name plates. The names, &c., are in black characters and quite distinct in every way—exceedingly, business like. A second form can be used, viz., a few name plates fixed to the walls of houses, if preferred by the authorities. A payment would, it is assumed, have to be made to the local authorities for use of the lamps. Therefore persons desiring their names to appear will have to pay Messrs. Pearce, Lever, and Co. a reasonable charge. As there are so many strangers continually coming to London on business, the difficulty of finding offices and shops is so great, and so much time is lost in hunting for book directories, the cost of inserting names should not be demurred to by business people. We have seen the plates for Fleet-street, which, as they show the various newspaper offices of that time-honoured literary mart will be welcome assistance to a large class of persons. For the above reasons we suggest to the local authorities that as small a charge as possible should be made. Another advantage remains to be stated, viz., that at night the light is

thrown naturally upon the panels, so in one minute the work of half-an-hour or more is effected.

We think that a great deal of public spirit is displayed in promoting such means of affording useful information to the public, and are glad to learn that the Town Council of Manchester has unanimously adopted the scheme, and eight directories are being placed in Market-street; also six in Briggate, Leeds, and six in New-street, Birmingham.

ON THE PERMANENT WAY OF RAILWAYS.

By Mr. R. Price Williams, M. Inst. C.E.

When, ten years since, the subject of the maintenance and renewals of permanent way was discussed at the Institution of Civil Engineers, steel rails might be said to have been on their trial. In the few instances where they had been used, they were laid rather as an experiment at stations, and in situations where, from the slow speed of the traffic, no risk was incurred of those sudden fractures to which, it was feared, their brittle character rendered them peculiarly liable. Experience had, however, shown that these fears were groundless and that steel, with the small percentage of carbon used for rails, was a material greatly superior to iron, both in strength and in durability, and not more liable to sudden fracture. Steel rails had now almost entirely superseded iron rails on the main lines in this country, and the recent reduction in cost of manufacture would probably lead to steel being used exclusively for rails.

In 1865 the average life of iron rails under heavy traffic was only three years. Since then, the goods and mineral traffic on some of the principal English railways had been doubled, and even trebled. As might be expected, this has led to increased expenditure in the maintenance and renewals of the permanent way, but in nothing like the same proportion—a fact testifying to the more durable quality of the materials. Thus in the last ten years on the Great Northern Railway the tonnage had increased 177 per cent., while the cost per mile of maintenance had only risen 45 per cent.; on the Midland the tonnage had increased 113 per cent., and the cost of maintenance 64 per cent., the chief portion of this latter increase being for materials. On the South-Eastern and the London and Brighton lines, the relatively small increase in the cost of labour per mile was observable, but there had been a considerable increase in the cost of staff and office charges.

In 1868, the half-yearly reports of the railway companies were required to be prepared according to a uniform system. The distinction between the maintenance and renewals was then abolished. The cost of maintaining the sidings, points, and crossings, hitherto included in "station works," was charged against "maintenance of way." The author arranged the tables and diagrams in accordance with this new system. In comparing the cost of maintenance on different railways, it was necessary to take into account the gradients, weight, and speed of traffic in each case, as also the relative mileage of single, double, and triple lines, length of sidings, &c. To afford a common basis of comparison, is given the cost of maintenance both per mile of railway and per mile of single line; and much more uniformity was found in the latter than in the former.

The average cost of the maintenance and renewals of the permanent way on the Great Northern Railway, during the year 1865, was £124 per mile of single line, the net cost of relaying a mile of single line with iron rails being £1,371. Dividing the latter amount by 124, gave eleven years as the average "money life" at that time; in other words, the annual sum then spent would renew the entire mileage of the railway in that period. In 1875, when steel rails were used, the cost of maintenance and renewals per mile of single line was £184·78, the net cost of relaying a mile of single line being £1,626, giving a "money life" of only nine years. The "money life" of this permanent way had therefore diminished during the last ten years, a result due partly to the rise in wages, but chiefly to the increased amount of labour in upholding the substructure of the road; indeed, the cost of labour in "maintenance" amounted to four times the labour required for "renewals." On comparing the average cost of the maintenance and renewals of the nine principal English railways, it appeared that on the Lancashire and Yorkshire Railway it was the highest, and that consequently the "money life" was the least, viz., only 6·66 years; the maximum "money life" being found on the South-Eastern and the London and Brighton Railways, viz., 10·50 and 10·38 years respectively. The average annual cost per mile of single line of the nine railways alluded to during the last ten years, was about £158 per annum, equivalent to an average "money life" of 7·61 years, assuming iron rails to have been used for the renewals. During 1875, the average cost of maintenance of these nine railways had been £213·64 per mile of single line, which, even assuming, as was not the case, that steel rails had been entirely used for renewals, gave only 7¾ years as the present "money life" of nearly one-half the railway mileage of the kingdom. The annual cost of the maintenance of the permanent way on these railways represent 2·10 per cent. interest on the ordinary capital, so that one year's increased "money life" would be equivalent to an addition of ¼ per cent. interest on such capital—a fact which showed the importance of the efforts to render the permanent way more durable.

The actual life or duration of the permanent way should not be confounded with the "money life," the latter being merely the ration which the annual cost of maintenance bore to the cost of construction. In the author's previous paper, it was mentioned that some iron rails on a portion of the Great Northern Railway had only lasted 2½ years. The rails which replaced these in 1863, guaranteed for seven years, were not taken up finally till 1870; in the meantime, however, a great portion of them had been renewed, so that the average life was only about 5½ years. The life of rails was entirely a question of tonnage, and of speed and frequency of the trains. Thus on the loop line of the Great Northern Railway, from Peterborough to Gainsborough, which was opened in 1848, and where the traffic was much smaller than on the main line, the earliest renewals of the rails occurred in 1868, and only within the last year had the up line been renewed throughout. In the down line some of the original rails were still in the road, after 28 years' wear, during which period about 39 million tons of traffic had passed over them. The East Lincolnshire section of the Great Northern Railway was opened the same year as the Loop. Only 21 per cent. of the up line and 4 per cent. of the down line had been renewed, the rails still in the road having a considerable amount of wear in them. The tonnage over these rails had been 13,400,000 and 14,300,000 tons on the up and down lines respectively. During the last ten years 85 per cent. of the mileage of the Great Northern Railway had been renewed, and the average life of the rails was nearly sixteen years. With this average of life of iron rails, and assuming that sleepers lasted 8 years, the estimated average cost of renewals per annum would be £128·90 per mile of single line, while the actual cost had been £139·55.

Steel rails were first laid on the London and North-Western Railway at Camden Town in 1862, and at Crewe Station in the following year. Diagrams were exhibited showing the wear and amount of tonnage which had passed over the latter. On an average, it appeared that a wear of 1-16th of an inch of the tables corresponded to a traffic of 9,370,777 tons. On the Great Northern Railway steel rails were first used at the coal sidings at King's Cross, but the tonnage over them could not be ascertained. In February, 1867, steel rails were laid in the up and down lines in Maiden-lane Tunnel. On the down line the traffic was of a heavy character, consisting chiefly of shunting. A diagram was exhibited showing the worn outlines of these rails, the tonnage over them, and the chemical constituents of the steel. The traffic corresponding to a wear of 1-16th of an inch of the tables varied from 5,251,000 to 31,061,000 tons. Similar diagrams were exhibited, showing the wear, the tonnage, and the chemical analysis of steel rails on other portions of the Great Northern Railway. Steel rails were first laid in the running road in 1866-7, on the up line, near Hornsey. A template of one of these rails was exhibited, showing a wear of only 0·15 of an inch during a period of 9¼ years, the traffic having been 66,546,000 tons, equivalent to 27,727,000 tons for every 1-16th of an inch. The proportion of carbon in this rail was only 0·320 per cent. The analyses for this communication were all made by Mr. Riley.

The Metropolitan Railway was opened in January, 1863, as far as Farringdon-street, and the extension to Moorgate-street in 1865. The greater part of the steel rails had been worn out, and, in some cases, twice renewed, owing to the enormous traffic. The renewals chiefly occurred near the stations, where the breaks attained their maximum effect, that was intermediate between the points where the breaks were first applied and the station platform. Diagrams were shown of the worn outlines of these rails, of the tonnage over them, and also of the chemical analyses of the steel—the most noticeable features being in the case of the rails in the Clerkenwell tunnel, where a considerable difference in the wear was observable in the wet and dry portions of the tunnel, although the amount of traffic was the same.

In a recent paper, the process of hammering the ingot had been recommended in preference to first cogging it, and then rolling it into the finished rail, the latter process having, it was stated, the effect of injuring the metal. The author has had some experiments made at Mr. Kirkaldy's with a view of practically testing the relative merits of the two systems. The results of these experiments showed, that rails rolled direct from cogged ingot had decidedly the advantage, being about 2½ per cent. stronger on the average than those rolled from hammered ingots. On the Great Northern Railway rails rolled from "cogged" ingots had endured ten years of the heaviest traffic, and were still in a serviceable condition.

The author also made experiments as to the relative strength of deep and ordinary fish-plates. The results showed that the average strength of the deep fish-plate was 67 per cent. of the strength of the solid rail, whereas the average strength of the ordinary fish-plate was only 22 per cent. Experiments were likewise made to determine the transverse strength of steel rails, with punched, drilled, and partly punched and drilled fish bolt-holes; likewise steel rails which, previous to being subjected to punching, drilling, &c., have been toughened by being plunged in water when hot. It was thus ascertained that the strength of steel rails not subjected to the toughening process, with holes punched cold in the ordinary way, was 65·39 per cent. of that of the solid rail; whereas the strength of the rails with drilled holes was 98·68 per cent., and the partly punched and afterwards drilled rails 97·80 per cent., of the strength of the solid rail. The effect of the toughening process was materially to increase the strength of the steel rails, especially the rails with the punched holes, which showed an increased strength of about 58 per cent. as compared with the untoughened punched rails.

In conclusion, the author hopes that in future steel rails would be made of such uniform quality as would ensure, as an average, the maximum endurance already met with in some of the instances referred to—about thirty million tons for a wear of 1-16th of an inch of the tables. With such a quality of material, the average life of a steel rail would be about 300 million tons, equivalent on the most heavily worked portion of the Great Northern Railway to a forty-two years' life. The effect of this increased duration would be to reduce the present average annual cost of renewals, viz., £213, to about £107 per mile of single line.—*Abridgment of Paper read at the Institution of Civil Engineers.*

ANCIENT NAVAL TACTICS.

Recently, at the United Service Institution, the Rev. E. Warre, of Eton College, delivered his second lecture on this subject, Vice-Admiral T. H. B. Spratt in the chair. The rev. lecturer pointed out that the ram or beak was long the most formidable weapon of the ancients, and was the one weapon which they used in common with moderns. The earliest types of vessels were depicted upon the Egyptian sculpture, and to this people he attributed the first maritime enterprises. The Phenician vessels were later and advanced types. All these ships were beaked in a manner that must have been inconvenient and dangerous, and Polybius mentioned the case of a ram being broken off, and so causing the vessel to sink. From this point Mr. Warre traced the construction of ramming vessels by the Greeks and Romans, and the successive changes made to improve their construction both for offensive and defensive purposes. The details exhibited a large amount of learned research. Some of the statistics were striking. Comparing ancient with modern tonnage and manning, it was computed that the Attic fleet of B.C. 330 consisted of 411 vessels, with a tonnage of 98,085; the Russian fleet of 1854 in the Crimea was of 72,000 tons. During the next five years, from 330, the Attic fleet was increased to 103,577 tons. The present tonnage of the British navy was about 300,000, of the French 200,000 in round numbers. The fleet of Xerxes, which consisted of 1,207 triremes, must have had 280,627 tons measurement; the great fleet of the Romans at the battle of Ecnomus consisted of 364 quinqueremes of 193,376 tons. Xerxes' crews were estimated at upwards of 340,000 men; the Attic navy at the time of Demosthenes required 90,000 men for its annual service; the Roman fleets in the Punic war carried nearly 120,000 men. At the close of the lecture a cordial vote of thanks was passed to Mr. Warre.

FOREIGN SCIENCE.

In turning over the pages of the recent numbers of L'Abbé Moigno's valuable magazine, *Les Mondes*, we are struck with a paragraph headed "Description of Fixed Stars, by Abel-al Ratmanal-Sufi," the Persian astronomer, being a notice of the same, and the original being literal translations of two Arab manuscripts; one of which was found in the royal library of Copenhagen, and the other in the Imperial library of St. Petersburg; this last contained the notes of Dr. Schjellerup, of the observatory of Copenhagen. The first of these manuscripts is an exemplar copied in 1601, after another transcription on that of Sufi, and it was found in 1763 in possession of Niebuhr. Sufi was an extremely learned man, born in 903 of our era. He lived at Bagdad at the court of Schwaz, and it appears that it was for the instruction of the monarch that his work on the stars must have been written. The descriptions are based on the precepts of Ptolemy, but the sizes given display sufficient differences to see that Sufi has not limited himself to a translation. Dr. Schjellerup says his work has been without equal for ten centuries until the illustrious Argelander published his *Uranome tria nova.* Dr. Schjellerup has given in the introduction to his work a comparative table of the sizes *(grandeur)* of the principal stars taken from Sufi and the other two authorities. This table will be found valuable in the case where we can suppose that the great stars are variable. In the table the evolutions of ancient and modern sizes are given in a conveniently comparative form. We gather from it that the relative sizes present occasionally slight differences. They show on the whole as great a concurrence as could be hoped. The Doctor, referring to another astronomer, Almagési, warns us against him, as the sizes cannot be trusted on account of their being given in round numbers. L'Abbé Moigno says the Doctor's translation of the Arabian MSS. is singularly valuable, and is a great addition to the history of stellar astronomy.

Our own opinion is that astronomy, besides being a very captivating science, is capable of great development and of consequent magnificent results in advancing even absolutely useful practical science. The views of the ancients in regard to stellar and general astronomy are therefore most welcome when produced in an available form such as specified. We suppose, and probably with justice, that occasional facts would be supplied which, masticated, so to speak, by modern astronomers, might develop wonderfully new light, and establish a magnificent, veritable theory.

A new Technological Dictionary in German, English, and French has just been produced by MM. Alex. and Louis Tollhausen; published by Reinwold, 15, Rue des Saints-Pères, Paris. The three parts have been published at last. They came out separately and now the whole work has appeared. We are very glad to hear of this, and to coincide with a journalist that it is much needed by engineers and those connected with the industries, on account of the incessant development of international relations. The two first parts are spoken of very highly indeed on the Continent.

There is a new work by M. Lavaux, entitled "New System of the World; or, the First Forces of Nature." A reviewer speaks like an angry frequenter of Little Bethel: "Science without God is horrible!" No doubt of it, but more cultivated terms might be employed. He goes on to explain that M. Lavaux is singularly Christian in his views. Otherwise the book is an *exposé* of a theory of the forces of nature founded on other phases than those which have been admitted since Newton. The two principles of the material world for M. Lavaux are ether and atomy. According to his system, God being given as the ruler and first moving agent, he comments in a reasonable way upon the result.

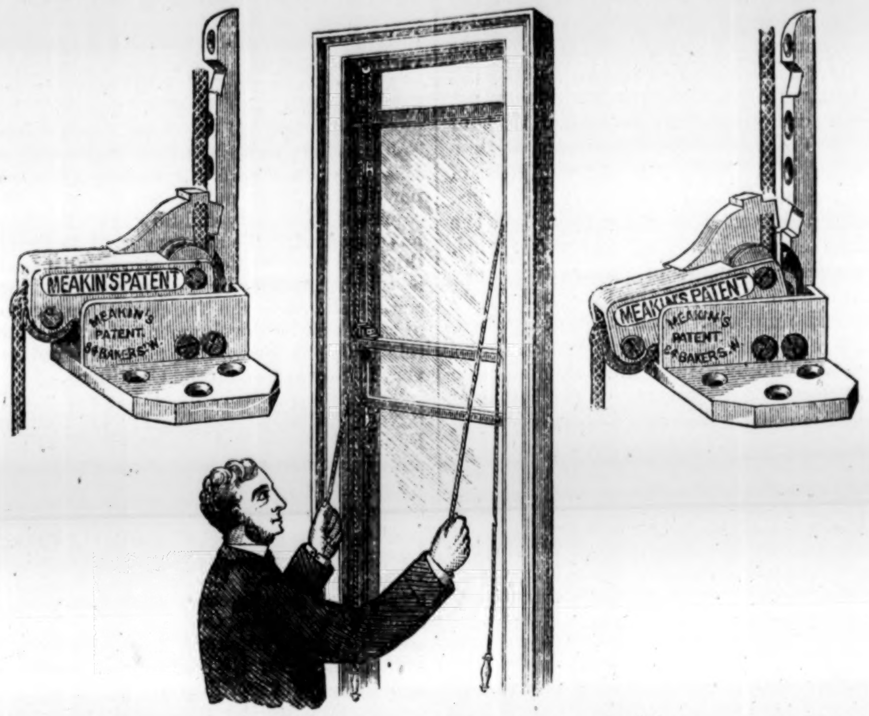
From the daily returns of the weather at the German University, Hamburg, and which, with the exception of the points to the extreme north and extreme south, relate to the whole of Europe, a repetition very worthy of attention is observed in the atmospheric pressure. The barometers have always been very low in the eastern regions; they have been raised in the west and north, which results in a domineering persistence in the winds of the north and east all over the Continent. The returns lead us to think that the state of things has extended very probably very far from the north to the west. The icebergs of Greenland and Spitzberg have descended in a marked proportion. We find this information in *Les Mondes*, but that periodical has, probably, had the advantage of the article in *Nature* on the subject, and which refers to the month of May.

It is useful to us to observe the French course of naval instruction. A regular course has been established at the naval observatory at Montsouris for officers attached to the establishment. This includes general principles of astronomical observations by M. Levy; special naval methods by Captain Turgult, director of the establishment; terrestrial magnetism by M. Marie Davy, director of the observatory at Montsouris.

M. Trouvé, on the radiometer of Mr. Crookes, an Englishman, says he would be desirous of knowing if the English author has given a logical definition of the movement of his tourniquet in presence of light. M. Trouvé finds a satisfactory explanation of his phenomenon in the resemblance to the theory of the electrical tourniquet. M. Trouvé attributes the movement to the diffusion of fluid, and not to direct action exercised by the light.

The Institution of Civil Engineers.—A new list of the Members of this incorporated society has just been issued, from which it appears that there are now on the books 2,876 of all classes, distributed as follows, viz: 868 Members, 1,595 Associates, 14 Honorary Members, and 399 Students. In the last three months there has been an increase of 13 Members, 45 Associates, and 8 Students, together 66; while the number of Honorary Members remains the same.

PATENT WINDOW SASH OPENER AND FASTENER.



These inventions were amongst those exhibited at the Exposition of Inventions that took place at the Members' Meeting of the Inventors' Institute on the 18th June.

The improvements in window-sashes are designed to obviate the great, though not the only, objection to our prevalent form of window-sash in the trouble and expense of putting in a new line. This operation necessitates the getting at the edge of the sash, and consequently removing the beads; and any contrivance that will effectually surmount the difficulty, is a boon that all owners of houses will doubtless appreciate.

Nothing of the kind has yet been devised that is at once so simple and so secure as the tubular sash-line-holder, patented by Mr. Meakin, and shown at his manufactory in Baker-street, Portman-square.

The apparatus, which may be described as a slotted tube, formed of sheet-iron moulded in a press, drops into a groove in the edge of the sash, formed to receive it; and a line, being inserted, is firmly held by pins of strong iron wire, placed at equal distances, and passing between the plaited fibres, through holes which have been pierced from side to side.

An ordinary carpenter can, with ease and celerity, and without risk of breaking the glass, affix a new line to any sash that has been fitted with this ingeniously perfect invention; and all that is visible inside the room is a small oval head of a pin-bolt, which, being thrust into a slot-hole in the face of the sash, keeps the tubular sash-line-holder securely in its place. Cups and screws are entirely dispensed with, and there is not the smallest complication that can in any way render the apparatus liable to get out of order.

The self-adjusting sash-fastener, which is also an opener and closer, is designed to effect an improvement on the modes of opening and fastening sash-windows that are at present in common use. When a window is of large size, the pulling down of the upper sash is a matter of no small difficulty; and the raising it again is worse. A long pole, with a kind of hook and crutch combined, is often to be seen in the best rooms of clubs and mansions, which awkwardly performs the function of hooking down and thrusting up the sash, to the no small danger of breaking the glass. Sometimes, however, means of pulling down the upper sash are provided in the shape of handles screwed to its lower rail, and only to be got at by first opening the lower sash almost to its full height. That this is a highly clumsy expedient is evident enough, and upper sashes which can be opened by no better means usually remain closed. When the pole or the handles have done their work, and the window has been closed, it still requires to be fastened, and many sashes are so high that a servant has to mount upon a chair or a pair of steps in order to reach the fastening. Now, all this trouble often prevents the windows from being open at the top at all, and so confines the ventilation of first-class rooms to the opening and closing of the lower sashes, thus depriving inmates of the benefit of the really efficient portion of the window.

Mr. Meakin's improvement is arranged to open and close the top sash, to fasten it when it is closed, and to unfasten it when it has to be opened, without any trouble except that of pulling a cord. His fastenings, of which two are used to a window (if wide) are fixed, not in the centre, but at the sides close to the frame, and a cord is carried from each over a pulley at the top of the frame. These cords are secured to the upper sash near the top, and the ends hang down, with handles or tassals appended, low enough to be easily reached. When it is required to lower the sash the cords are pulled, and their first effect is to unclose the sash-fastening, after which they draw down the sash steadily, at the same time exerting a pressure upon the lower sash, so as not to raise it while the upper one is being lowered. When it is required to raise the upper sash again, the process is simply to pull the other ends of the cords, and thereby to re-close the window. The fastening then locks itself, and will hold both sashes secured until it is again released. By slightly drawing down the upper sash the lower one is free to be raised and lowered as in any ordinary window. A recent improvement in the shape of the catch has rendered it so secure as to defy any efforts of burglars to open it from the outside by the help of their steel instruments.

By means of the new sash-opener and secure self-acting sash-fastener, when the window is closed, the largest frame, filled with the most massive plate-glass, may be lowered with such ease as is only comparable to that of putting on a well-fitting glove, and in less than a quarter of the time usually occupied in this operation. The Foreign Office, Privy Council Office, Board-room of Kensington Museum, the Bank of South Australia at Adelaide, London and County Bank, Lombard-street, and many other important buildings have been, or are being, fitted with Mr. Meakin's apparatus.

The woodcut shews the sash-fastener and opener as when brought into action.

RECENT AMERICAN INVENTIONS.

Signal Lantern.—George J. Cave, Elizabeth, N.J.—This is an arrangement of concentric shells and coloured glass tubes, so combined that the rush of the mechanism may be readily and quickly adjusted, by a rotary movement, to display a white light, a red light, or a green, or other arrangement of colours, and which shall have no projecting arms, handles, or levers to be in the way.

Truss Pad.—Charles L. Warner, Homer, Iowa.—This is an improved pad for trusses for the cure of hernia; and consists of a pad connected to the base plate of a ball-and-socket joint, and suitable detaining devices.

Combined Top and Whirligig.—Reuben N. Garrett, Ballston Spa, N.Y.—In using the top as a toy, a top-shaped head is placed loosely upon the end of a pin, and the cord is wound upon the said pin, within the fork of the usual top handle. Then by pulling sharply upon the cord, the pin and the head will receive a rotary motion, and the head will be thrown from the pin, and will spin upon the floor. In using the top as a whirligig, the cord is wound upon the pin, within the fork of the handle, and by pulling upon the cord the pin and the head will receive a rapid rotary motion.

Liquid Cooler.—John Downing, Binghamton, N.Y.—This consists of an ice chest in which are secured a series of jars. In the case of a water cooler the inlet pipe of the first jar is connected with the water supply pipe, and the outlet pipe of each preceding jar is connected with the inlet pipe of each succeeding jar. The outlet pipe of the last jar is connected with the discharge pipe. By this arrangement the water is drawn from the last jar of the series, which is immediately replaced by partially cooled water from the next jar, and so on, the water from the reservoir entering the first jar, so that cold water can be drawn almost continuously.

Clothes Line.—Elias Stillwell, Rockwell, Mo.—The invention relates to means whereby a clothes line may be gradually run out from a given position convenient to the person engaged in the washing operation. This is done as it receives the garments that are to be dried, so that the washer may not be required to go far from the washroom in order to hang the clothes. It also relates to a mode of tightening the line and protecting it from the weather. Endless lines are carried over two rollers, at a suitable distance, one of which is provided with a crank, by whose aid the lines may be caused to travel back and forth.

Sign Plate.—Julius Cæsar, New York city.—This is an enamelled door or other plate that is secured to a metallic border frame and attached thereby to the door, without requiring the direct passage of the fastening bolts through the plate.

Locket.—David Untermeyer, N.Y.—This locket is composed of pivoted parts, one holding a picture on both sides, and having opposite rims that fit over and enclose the pictures.

Shot Cartridge. — Thomas Wilkinson, Brooklyn, E. D., N. Y.—This is formed by placing perforated shot upon sets of wires between two wads.

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THE INVENTORS' INSTITUTE,

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ESTABLISHED 1ST MAY, 1862.

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SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1875-76 IS NOW TERMINATED.

TO MEMBERS OF COUNCIL.
Council meetings according to notices, which will be sent by post.

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F. W. CAMPIN, Sec.

Proceedings of the Institute.

ON June 8th, the Executive Council met at 4, St. Martin's-place, Trafalgar-square, when the chair was taken by ADMIRAL SELWYN. This being the first meeting of the Executive Council held since the Annual Meeting, the new members then present, Messrs. A. Sweet and T. Paterson, took their seats at the Council.

The minutes of the last Executive Council were read and confirmed as being correctly entered. After this the Secretary gave a report of the proceedings at the last Annual General Meeting, when Dr. R. H. Collyer entered the room, and, as a member of the General Council, signified his desire to make a statement with regard to the regulations of the Annual General Meetings; but after hearing his statements it was decided that the Executive Council was not competent to deal with such a question, which could only be dealt with by a General Meeting, and Dr. Collyer then withdrew.

The meeting then proceeded to consider what ought to be done with regard to the resolution passed at the General Meeting establishing a Financial Committee, when the following Members were appointed thereon:—The President, Admiral Selwyn, Dr. McGrigor Croft, T. Paterson, S. Calley, and the Secretary.

The Secretary, having reported that Mr. Sampson S. Lloyd, M.P., had presented to the House of Commons the Petition of the Meeting at the Society of Arts, and had the same read at the table, it was ordered that the thanks of the Executive Council, on behalf of the Institute, be tendered to that gentleman.

The Members' Meeting on the 8th June was devoted to an exposition of several inventions of great interest, namely, Mr. CARL PETERSEN'S Indicator of Speed of Propeller Shafts; a Calculating Machine, by the same gentleman; also several important inventions relative to the Opening and Closing of Windows and Doors, by Mr. MEAKIN; Mr. S. CALLEY'S plan of Lowering Boats from Ships at Sea; a Tinplate Tinning Machine, and some others. After careful inspection by those present, these elicited expressions of general commendation. Mr. CALLEY'S invention has already been described in our columns; the others are reserved for publication hereafter. This terminated the Session 1875-6.

Monthly Notices.

The death of Mr. A. R. Marvine, of the United States Survey, should not, the *Athenæum* truly says, be allowed to pass without some notice. At the early age of twenty-eight, he has fallen a victim to his zeal in the task to which he devoted his powers. Disease contracted in Colorado, amidst the wilderness of canons, crags, and peaks prostrated him. He was never able to resume his work, and on the 2nd of March he died. His published Reports are a sufficient evidence of his ability and of his industry.

"*The Life Work of Liebig* in Experimental and Philosophical Chemistry, with allusions to his influence on the development of the Collateral Sciences and the useful Arts," the Faraday Lecture, delivered by Prof. A. W. Hofmann, on March 18th, 1875, has just been published. The book is worthy of the careful study of all young chemists.

Experiments on the use of the electric light have been made on the Great Northern Railway of France. Under the direction of M. Fresca, the luggage department of the Paris Station has been illuminated by a three-horse power Gamme machine. M. Fresca states, in his Report presented to the Academy of Sciences, that the electric light is a hundred times less expensive than oil, and fifty times cheaper than gas.

Electric Piles are, according to M. Onimus (who, through M. Edmond Becquerel communicated to the Académie des Sciences several modifications), to be rendered in construction more easy and more economic. These modifications consist, for the most part, in the introduction of paper parchment, which acts more efficaciously than the porous vessels, as a dialyser, and which can be applied with great facility.

Herr Haggenmacher, the unfortunate secretary of Munzinger Pasha, who was murdered, with his chief, on the road to Shoa, has left behind him a most valuable account of an expedition into the Somali country. This account has now been published as a supplement to Petermann's *Mittheilungen*, and will secure for its author a honourable place amongst African travellers. He penetrated about 130 miles to the south of Berbera, and the record of his travels, as well as his general remarks on the country and its mongrel inhabitants, will be read with interest at a time when the aggressive policy of Egypt is drawing attention to that part of Africa.

The Albert Nyanza, according to information forwarded from Khartum, has been successfully navigated. It is stated to be 141 English miles long and 60 wide, and eight rivers flow into it. This information, however, requires confirmation.

Dr. Wyvile Thomson will shortly put before the public his account of the scientific results of the expedition of H.M.S. Challenger. He has from time to time been sending home to Messrs. Macmillan and Co. such portions of his narrative as he had leisure to write on board ship, together with a large number of drawings of the many curious forms of animal life now first brought to light, executed by Mr. Wild, the artist of the expedition. Two volumes, containing the results of the dredging of the Atlantic, and fully illustrated from Mr. Wild's drawings, will be published in the autumn, to be followed by two others, in which will be recorded the discoveries made in the Pacific and Southern Seas.

Dr. Robert Brown is now engaged upon a work of exploration and discovery, illustrative of the appearance, productions, industries, society, and wonders of the various countries of the world, illustrated with maps and wood engravings. The work will be published in serial form by Messrs. Cassell, Petter, and Galpin.

Dr. Arthur Gamgee, F.R.S., Professor of Physiology in Owens College, Manchester, is preparing a treatise on the Physiological Chemistry of the Animal Body, to be published by Messrs. Macmillan and Co.

M. Pasteur, in a discussion at a recent séance of the Academy of Sciences, contended that oxygen and light were not essentials to life, stating that he developed life in an atmosphere of pure carbonic acid, and in absolute obscurity. M. Boussingault, however, expressed his opinion that the influence of light was indispensable to life.

R. Comitata Geologica d'Italia for March and April, 1876, contains several important geological papers and mineralogical communications, especially "A Stratigraphic Survey of the Pliocene Formations of Mid-Italy," by Signor G. Seguenza, and a continuation of M. P. Zezi's "New Mineral Species, Studied and Described during 1873-1875."

Proceedings of Societies.

ROYAL SOCIETY.

JUNE 1ST.—Dr. Hooker, C.B., President, in the chair.—The Annual Meeting for election of Fellows was held. The following were elected:—Capt. W. de W. Abney, Prof. H. E. Armstrong, Rev. W. B. Clark (New South Wales), J. Croll, E. Dunkin, Prof. J. E. Erichsen, Dr. D. Ferrier, Col. A. H. Lane Fox, Prof. A. H. Garrod, R. B. Haywood, C. Meldrum (Mauritius), E. J. Reed, Prof. W. Rutherford, R. Swinhoe, and Prof. T. E. Thorpe.

June 15th.—Dr. Hooker, President, in the chair.—There were admitted, Capt. Abney, W. Archer, E. Dunkin, Prof. Erichsen, Dr. Ferrier, Col. Lane Fox, Prof. Garrod, R. B. Hayward, E. J. Reed, Prof. Rutherford, and and R. Swinhoe. The following papers were read: "Report to the Hydrographer of the Admiralty on the Voyage of the Challenger from the Falkland Islands to Monte Video," by Prof. W. Thomson, "Preliminary Note on the Structure of the Stylasteridæ, a group of stony corals which, like the Milleporidæ, are Hydroids and not Anthozoans," by Mr. H. N. Moseley,—"On the Comparative Anatomy of the Auditory Ossicula of the Mammalia," by Mr. A. Doran,—"On the Leaf Arrangement of Crowberry *(Empetrum nigrum)*," by Dr. H. Airy,—"On Two Vanadium Minerals," by Prof. Roscoe,—"The Action of Light on Selenium," by Messrs. W. G. Adams and R. E. Day,—"On the Forms assumed by Drops of Liquids falling vertically on a Horizontal Plate," by Mr. A. M. Worthington,—"An Experiment on Contact Electricity between Non-conductors," by Mr. J. Thomson,—"Researches illustrative of the Physico-Chemical Theory of Fermentation, and of the Conditions favouring Archebiosis in previously Boiled Fluids, No. I.," by Dr. Bastian,—"On the Variations of the Daily Range of Atmospheric Temperature as recorded at the Kew Observatory," by Mr. B. Stewart,—"On the Application of the Principle of Reciprocity to Acoustics," by Lord Rayleigh,—"On Phosphorus Pentafluoride," by Prof. Thorpe,—"On the Determination of Verdet's Constant in absolute Units, 1 and 2 Memoir,"—by Mr. J. E. H. Gordon, "On Supersaturated Saline Solutions," by Mr. J. G. Grenfell,—"On some Elementary Principles in Animal Mechanics, VIII., the Law of Fatigue," by the Rev. S. Haughton,—"On Volta's Experiment of the Electricity produced by the Contact and Separation of Zinc and Copper," by Messrs. W. De La Rue and Hugo Muller,—"Preliminary Report of the Biological Results of a Cruise in H.M.S. Valorous to Davis's Strait," by Mr. J. G. Jeffreys,—"Note on the Mycelium described in his Paper on Small-pox of Sheep," by Dr. Klein,—"Note on certain unusual Coagulation Appearances in Mucus and other Albuminoid Flein,—"Note on certain unusual Coagulation Appearances in Mucus and other Albuminoid Fluids," by Dr. Creighton,—"On Repulsion resulting from Radiation, Influence of the Residual Gas," by Mr. W. Crookes,—"Preliminary Note on the Use of the Piezometer in Deep-Sea Sounding," by Mr. J. Y. Buchanan,—"On Organoboron Compounds," by Dr. Frankland, — "Contributions to Terrestrial Magnetism, XV.," by Sir E. Sabine,—"Observations as to the Changes which occur in the Connective Tissue of the Tongue in the Process of Inflammation," by Mr. G. Dowdeswell,—"A Contribution to Terrestrial Magnetism, being the Record of Observations of the Magnetic Inclination or Dip made during the Voyage of H.M.S. Iron Duke to China and Japan, 1871-75," by Sir C. Shadwell,—"On the Physiological Action of the Bark of *Erythrophleum Guinense*, generally called Casca, Cassa or Sassy Bark," by Dr. T. L. Brunton and Mr. W. Pye,—"Note on Independent Pulsation of the Pulmonary Veins and Vena Cava," by Sir J. Fayrer and Dr. Brunton,—"Report on the Physical Investigations carried on by P. H. Carpenter in H.M.S. Valorous, during her Return Voyage from Disco Island in August, 1875," by Dr. W. B. Carpenter,—and "On Certain Integrals," by Mr. W. H. L. Russell. The Society adjourned over the Long Vacation.

ROYAL INSTITUTION.

JUNE 5TH.—G. Busk, Esq., Treas. and V.P., in the chair. General the Lord Sandhurst, Major H. Collett, the Rev. S. D. Stubbs, Messrs. G. A. Dick, T. G. B. Lennard, and S. M'Henry were elected members. Mr. S. Busk was elected Visitor, in the room of Mr. R. P. Linton, deceased.

GEOLOGICAL SOCIETY.

MAY 24TH.—Prof. P. M. Duncan, President, in the chair.—The following communications were read:—"On the Old Glaciers of the Northern Slope of the Swiss Alps," by Prof. A. Favre,—and "Evidences of Theriodonts in Permian Deposits elsewhere than in South Africa," by Prof. R. Owen.

June 7th.—Prof. P. M. Duncan, President, in the chair.—Dr. W. S. Gervis, Messrs. J. Atkinson, E. Clark, F. Derry, T. Jones, jun., B. Latham, and E. Sewell were elected Fellows. The following papers were read: "On the British Fossil Cretaceous Birds," by Mr. H. G. Seeley,—"On Two Chimæroid Jaws from the Lower Greensand of New Zealand," by Mr. E. T. Newton,—"On a Bone-Bed in the Lower Coal-Measures, with an Enumeration of the Fish-Remains of which it is principally composed," by Mr. J. W Davis,—"Note on a Species of Foraminifera from the Carboniferous Formation of Sumatra," by M. J. Huguenin—and, "On the Triassic Rocks of Somerset and Devon," by Mr. W. A. Ussher.

GEOGRAPHICAL SOCIETY.

JUNE 12TH.—Sir R. Alcock, President, in the chair.—The following gentlemen were elected Fellows: Major-General Abbott, Lieut-Col. W. E. Warrand, Captain W. A. F. Blakeney, Messrs. G. P. Boyer, D. Brandon, W. G. Bridal, H. D. Gardner, F. H. H. Guillemard, W. O. Hirst, C. St. George Littledale, B. J. Malden, and T. White.—The papers read were, "Journey to the Northern End of Lake Nyassa," by Mr. E. D. Young,—and "Valley of the Twagy, South Brazil," by Mr. T. P. B. Wither.

ASTRONOMICAL SOCIETY.

JUNE 9TH.—Dr. W. Huggins, President, in the chair.—A paper, by Prof. Newcomb, was read, "On a hitherto Unnoticed Apparent Inequality in the Longitude of the Moon." The inequality was, it appeared, brought to light in the course of an investigation which has recently been made by Prof. Newcomb of the corrections to be applied to Hansen's "Tables de la Lune," in order that they may be used for the determination of the longitudes of the transit of Venus stations. Prof. Newcomb set himself to compare the places derived from Hansen's tables with the series of lunar observations made at Greenwich and Washington between the years 1862 and 1874. The residual errors of the moon's place showed a systematic inequality, which could not be got rid of by any new assumption as to the value of the corrections of the lunar elements. There can be no doubt about the existence of the inequality, because both the Greenwich and Washington observations agree in showing it, and a close investigation shows that the errors are periodic, and depend upon the moon's longitude. In order to make the investigation more complete, Prof. Newcomb has determined the corrections for the years 1847 to 1858, for which period the residual errors of Hansen's tables are given in the Greenwich observations for 1859. A table of the resulting corrections is given in the paper, and it appears that the period of the chief term of the new inequality is $16\frac{2}{3}$ years, with a probable error of half a year. The corresponding period of the inequality in longitude is 27·4304 days ± 0·0040 days, and there is a large preponderance of probability against the real period being less than 27·42 days or more than 27·44 days. No known term in the moon's longitude falls within these limits. The moon's sidereal period is 27·32 days, and the anomalistic period is 27·55 days, so that the new term falls half way between the two. The non-accordance of this period with any term heretofore sought for is the probable reason why this term has not before been noticed. A term, if unknown, would not be remarked unless its value was such as visibly to affect the individual comparison of theory with observation, and Hansen's tables, as corrected, are the first of which the residual errors are so small that a term of $1''\cdot5$ would be remarked in the comparison with observations. Prof. Adams said that he was at a loss to imagine what the cause of this inequality can be. He was rather inclined to suppose that it may have something to do with the effect of the figure of the earth on the motion of the moon, but this was only an idea thrown out on the spur of the moment. — Lord Lindsay exhibited an adaptation of the ordinary altazimuth instrument, designed to give a rough equatorial motion. To the base of the altizimuth pillar is fixed an iron bar, through a hole, in which a string or wire is attached to the object-glass end of the telescope; the only adjustments that are necessary are that the horizontal bar shall be placed approximately north and south, and that the distance from the base of the altazimuth pillar to the hole in the bar through which the string passes shall be equal to the height of the pillar into the co-tangent of the latitude of the place of observation. Mr. Plumber read a paper "On Photometric Experiments upon the Light of Venus." By comparing the shadow of a wire cast by the light of the planet with the shadow of a similar wire cast by a candle at the known distance, and again, by comparing the light of the candle with the light of the full moon, he came to the conclusion that the light of Venus at its greatest brilliancy was equal to 1-799·5 of the brightness of the full moon, and, by a similar method, he found that the light of Jupiter, at mean opposition, was equal to 1-6480 of the light of the mean full moon.

MICROSCOPICAL SOCIETY.

JUNE 7TH.—Mr. H. J. Slack in the chair.—Two new Fellows were elected. A paper "On a Photograph of Norbert's Bands," by the Count Castracané was read, and was supplemented by a short communication upon the same by Mr. H. C. Sorby. Mr. H. Davis gave an account of some new observations which he had made upon Conochilus, and illustrated his remarks by drawings showing the principal features of the genus as distinguished from the Melicertians. Mr. C. Stewart described and exhibited under microscopes in the room some minute spines found only round the pentagonal opening on the under side of the shell of the Echinoderms; he also gave a description of the remarkable structure of the large lachrymal gland of the common turtle, and illustrated his remarks by drawings and microscopical preparations. Notice was given that the rooms and library of the society would be closed during the month of August.

PSYCHOLOGICAL SOCIETY.

JUNE 1ST.—Mr. Serjeant Cox, President, in the chair. The President read a paper, "On the Psychology of Memory and Recollection." He contended that memory indicated the existing of something other than the brain, by which the impressions made upon the brain are stored away; that every impression upon the brain, however slight, was thus preserved; that the power to recall them was a distinct faculty, inasmuch as the memory may be good but the recollection bad, and that recollection is probably a function of the brain alone. A discussion followed. Some cases of remarkable psychological phenomena were reported by various speakers.

PHYSICAL SOCIETY.

MAY 27TH.—Prof. Gladstone, V.P., in the chair.—The following candidates were elected Members: Messrs. H. Taylor, R. Field, and C. Law. Mr. W. Ackroyd read a paper "On Selective Absorption." The Secretary read a communication from the Rev. R. Abbay, "On certain remarkable Atmospheric Phenomena in Ceylon." The most striking of these is witnessed from the summit of Adam's Peak, which is a mountain rising extremely abruptly from the low country to an elevation of 7,200 feet above the sea. The phenomenon referred to is seen at sunrise, and consists *apparently* of an elongated shadow of the mountain projecting westward to a distance of about 70 miles. As the sun rises higher it rapidly approaches the mountain, and appears at the same time to rise before the observer in the form of a gigantic pyramid of shadow. Distant objects may be seen through it, so that it is not really a shadow on the land, but a veil of darkness between the peak and the low country. It continues to rapidly approach and rise until it seems to fall back upon the observer, like a ladder which has been reared beyond the vertical, and the next instant it is gone. Mr. Abbay suggests the following explanation of the phenomenon. The average temperature at night in the low country during the dry season is between 70° and 80° Fah., and that at the summit of the peak is 30° or 40° Fah., consequently the low strata of air are much the less dense, and an almost horizontal ray of light passing over the summit must be refracted upwards, and suffer total internal reflection, as in ordinary mirage. On this supposition the veil must become more and more vertical as the rays fall less horizontally, and this will continue until they reach the critical angle, when total internal inflection ceases, and it suddenly disappears. Its apparent tilting over on the spectator is probably an illusion produced by the rapid approach and the rising of the dark veil, without any gradual disappearance which can be watched and estimated. It will be evident that the illumination of the innumerable particles floating in the atmosphere causes the aerial shadow to be visible by contrast. Another interesting phenomenon visible in the mountain districts admits of an equally simple explanation. At times broad beams, apparently of bluish light, may be seen extending from the zenith downwards, converging as they approach the horizon. The spaces between them have the ordinary illumination of the rest of the sky. If we suppose, as is frequently the case, that the lower strata of air are *colder* than the upper, the reflexion spoken of in the case of Adam's Peak will be downwards instead of upwards. If several isolated masses of clouds partially obscure the sun, we may have several corresponding inverted veils of darkness like blue rays in the sky, all apparently converging towards the same point below the horizon. This latter phenomenon is called by the natives "Buddha's Rays." Prof. Forel, of Morges, Switzerland, gave an account, in French, of some observations which he has recently made on the periodic waves which take place on the Swiss lakes, and are there called "Seiches." It was long since observed that the waters of most of these lakes are subject to a more or less regular rise and fall, which at times have been found to be as much as one or two mètres. M. Forel has studied the phenomenon in nine different lakes, and finds that it varies with the length and depth of the lake, and that the waves are in every way analogous to those already studied by Prof. Guthrie in artificial troughs, and follow the laws which he has deduced from his experiments. Most of the observations in Switzerland were made on the lake of Geneva, but that of Neuchâtel was found to be best fitted for the study of the subject, possessing as it does an extremely regular geometric form. The apparatus he employed was very sensitive to the motion of the water, being capable of registering the waves caused by a steamboat half an hour after it had passed and five minutes before its arrival, and was so constructed as to eliminate the effect of common waves, and to register the motion side by side with a record of the state of the barometer on paper kept in continuous motion. While he found the duration of waves to be ten minutes at Morges it was seventy minutes at Geneva, and this is explained by the narrowness of the neck of the lake at the latter place. This period he proved to be independent of the amplitude, and to be least in the shortest lakes. For shallow lakes the period is lengthened, and his observations show that the period is a function of the length and depth, and that longitudinal and transverse waves may coexist, just as Prof. Guthrie has shown to be the case in troughs.

June 10th.—Prof. G. C. Foster, President, in the chair.—Mr. W. J. Wilson exhibited and explained a reflecting tangent galvanometer, which he has recently designed for the purpose of exhibiting the indications of the instruments to an audience, and so arranged that the divisions on the scale show, without calculation, the relative strengths of different currents.—Mr. S. P. Thompson exhibited an electromotor clock, made by Mr. W. Hepworth, and provided with a commutator of Mr. Thompson's design. This part of the instrument is very simple, and reverses the current at each single oscillation by means of two light springs resting on inclined planes. The motion of the pendulum drives the train of wheels by modification of the gravity escapement, and a very small battery power is sufficient.—Prof. G. Fuller exhibited and described his "electric multiplier," an instrument which may be looked upon as an automatic electrophorus. An insulated plate of vulcanite is supported in a vertical position, and on each side of it is an insulated metallic plate, and these can be moved together, to and from the vulcanite, by rotating a handle. When these plates are far apart, two metallic arms, provided with points, are made to pass, one on each side of the vulcanite plate. One of these is insulated, and is provided with a rod, terminating in a knob, which, at a certain point in the path, almost touches the metallic plate on the opposite side of the sheet of vulcanite; the other arm is in connection with the earth. The action of the instrument is as follows: A charge of, say, negative electricity having been given to the insulated arm, it is passed over its face of the vulcanite, while positive is drawn up from the earth and thrown upon the opposite face by the uninsulated series of points. These arms are then removed, and the two metallic plates are brought into contact with the vulcanite. Call the side of the plate charged with negative electricity A, and the other B. The negative of A induces positive on the near face of its metallic plate, and repels the negative. This passes, by a strip of tin foil joining the two faces of the vulcanite, to the other metallic plate, neutralizing its free positive, and when the plates are moved away from the vulcanite, that from A is charged with positive and that from B with negative. Before reaching its extreme position, this latter communicates its charge to the insulated arm by the brass knob, and the electricity is then distributed over the face A. At the end of its path, B is momentarily connected to earth. It will be evident that the effect of again bringing the plates in contact is to increase the charge of positive electricity on the metallic plate opposite the face A. With the small model exhibited, Prof. Fuller has frequently obtained sparks an inch in length. Prof. Guthrie exhibited and employed Prof. Mach's apparatus for sound reflexion, which is one of an interesting series of appliances designed by him for the demonstration of certain fundamental principles in physics.

CHEMICAL SOCIETY.

JUNE 1ST.—Prof. Abel, President, in the chair.—A paper, "On Hemine Hematine and a Phosphorized Substance contained in Blood-Corpuscles," by Dr. J. L. Thudichum and Mr. C. T. Kingzett, was read by the latter.—Prof. W. N. Hartley made a communication, "On the Natural Carbon Dioxide from Various Sources;" being a continuation and extension of his former paper "On the Presence of Liquid Carbonic Anhydride in the Cavities of Quartz and other Minerals." Mr. Kingzett read a note "On some Trials of Frankland and Armstrong's Combustion Process *in Vacuo*," by Dr. Thudichum and himself,—Mr. T. Fairley gave a short account of three papers "On Peroxides," in which he described various reactions with hydrogen peroxide, and also the preparation of sodium and uranium peroxides; "On Chromic and Perchromic Acids;" and "On the Estimation of Nitrogen." The Secretary read a paper, by Prof. J. W. Mallet, "On Aluminium Nitride, and the Action of Aluminium on Sodium Carbonate at a High Temperature." The nitride forms small crystalline particles of a yellow colour. Mr. E. Neison gave a short account of "A Process for the Estimation of Mercury."

June 15th.—Dr. J. H. Gladstone, V.P., in the chair.—The first paper, by Prof. Dewar, entitled "Chemical Studies," was chiefly devoted to an account of several interesting lecture-experiments. Dr. H. E. Armstrong gave a short account of his elaborate "Researches on the Reduction of Nitric Acid," and on the Oxides of Nitrogen: Part I., on the Gases Evolved by the Action of Metals on Nitric Acid," made in conjunction with Mr. Accworth. Mr. C. T. Kingzett read a paper "On the Composition and Formula of an Alkaloid from Jaborandi." There were also papers "On the Simultaneous Action of Iodine and Aluminium on Ether and Compound Ethers," by Dr. J. H. Gladstone and Mr. A. Tribe,—"On Compounds of Antimony Pentachloride with Alcohols and with Ethers," by Mr. W. C. Williams,—"On the Volatility of Barium, Strontium, and Calcium," by Prof J. W. Mallet,—"On the Action of Chlorine on Acetamide," by Dr. E. W. Prevost,"—"Note on the Perbromates," by Mr. M. M. P. Muir,—and a communication "On a new and Convenient Form of Areometer for Clinical Use," by Dr. J. G. Blackley.

ASIATIC SOCIETY.

MAY 29TH.—Anniversary Meeting.—Sir E. Colebrooke, Bart., M.P., President, in the chair.—Capt. Norman and Mr. A. N. Wollaston were elected Members.—The following were elected as the officers of the society for the ensuing year:—Sir E. Colebrooke, Bart., President; Major-General Sir H. C. Rawlinson, Director; Sir R. Alcock, O. de Beauvoir Priaulx, and A. Grote, Vice-Presidents; N. B. E. Baillie, E. L. Brandreth, Sir G. Campbell, M. P. Edgeworth, J. Fergusson, Right Hon. Sir Bartle Frere, Major-General Sir F. Goldsmid, Dr. W. W. Hunter, Dr. Col. N. Lees, T. K. Lynch, Lord A. Russell, Lord Stanley of Alderley, M. J. Walhouse, Col. Yule, and H. W. Freeland, Members of Council; E. Thomas, F.R.S., Treasurer; W. S. W. Vaux, Secretary and Librarian; Prof. Chenery, Honorary Secretary; and R. N. Cust, Honorary Librarian.

June 19th.—Sir T. E. Colebrooke, Bart., President, in the chair.—Sir E. Colebrooke read an elaborate paper, by himself, on the titles borne, at different periods of history, by a large number of Oriental rulers.

INSTITUTION OF CIVIL ENGINEERS.

May 30th.—Mr. Abernethy, V.P., in the chair.—The Council have recently transferred Messrs. J. McN. Harkness, P. C. Lockwood, R. P. Sims, and J. N. Shoolbred from the class of associates to that of members; and had admitted the following candidates as students of the institution, viz., Messrs. R. S. Campbell, P. E. Dove, F. J. Ede, T. L. Galloway, R. Grindle, R. C. Mawson, A. Morse, C. A. Stoess, A. R. Sutherland, and B. H. Thwaite. The monthly ballot resulted in the election of thirty-two candidates, of whom five were members, Messrs. G. F. Adams, G. Baird, S. B. Coxon, E. Easton, and W. S. Harington, and twenty-six associates, Col. F. W. Peile, Major E. H. Steward, Messrs. J. Butler, F. S. Courtney, H. Dangerfield, A. G. Fenn, H. Gooch, E. F. G. Griffith, H. T. Hodgson, W. Langdon A. van Z. Macdonald, W. P. Orchard, the Hon. R. C. Parsons, W. Paulson, E. W. Plunkett, S. Preston, J. W. Randell, J. Shaw, A. Smith, A. T. Smith, J. P. Spencer, S. Stent, A. Thorne, R. C. Turner, C. H. A. Twidale, and C. H. Wilmot. The additions to the roll during the session have included thirty-four members, 187 associates (of whom twenty-five were previously students), and 119 students. The register now contains the names of fourteen honorary members, 870 members, 1,597 associates, and 400 students, making a total of 2,881, as against 2,659 at the same time last year.

SOCIETY OF ENGINEERS.

June 12th.—Mr. V. Pendred, President, in the chair.—The following gentlemen were elected: as Members, Mr. H. Clayton, jun., Mr. F. Howlett, Mr. J. G. C. Ulrich, Mr. A. F. H. Plambeck, Mr. F. Darkin, Mr. R. B. Austin, Mr. J. Bennett, Mr. F. S. Manners, Mr. J. T. Hall, Mr. S. Allan, Mr. C. Pieper, and Mr. C. E. Bainbridge; as Associates, Mr. E. de Pass, Mr. M. Mildred, Mr. W. S. Wilkins, and Mr. H. A. Carroll. A paper by Mr. H. Davey "On the Underground Pumping Machinery at the Erin Colliery, Westphalia," was read.

MATHEMATICAL SOCIETY.

June 8th.—Prof. H. J. S. Smith, President, in the chair.—Mr. Kempe spoke "On a General Method of Describing Plane Curves of the *n*th Degree by Link-work." Mr. Roberts gave an account of a "Further Note on the motion of a Plane under certain Conditions." Mr. Walker communicated a Note "On a Method of Reducing the Equation to a Nodal Plane Cubic to its Canonical Form, in which the Lines of Reference are the Nodal Tangents and Axis of Inflexion." Prof. Cayley described a Surface depending upon the Sinusoid. The President made a few remarks in connection with Mr. Hermite's recent Note "On a Theorem of Eisenstein's."

SOCIETY OF BIBLICAL ARCHÆOLOGY.

June 6th.—Dr. S. Birch, President, in the chair.—The paper read was "Chronological Remarks on the History of Esther, and Ahasuerus or Atossa and Tanu-Axares," by Mr. J. W. Bosanquet.

SOCIETY OF ANTIQUARIES.

June 15th.—F. Ouvry, Esq., President, in the chair.—A letter was read from the Town Clerk of Worcester, stating that the resolution of the Town Council to pull down the Guildhall of Worcester, an act against which the Society had forwarded a protest, had been rescinded at a subsequent meeting of that body. Mr. W. M. Wylie presented a lithograph of the mechanism of a curious crossbow, preserved in the Museum of Zurich. Mr. E. Peacock presented ten impressions of seals, chiefly foreign, from matrices in the possession of Mr. Winn, of Nostall Priory, and also a printed folio, in two leaves, giving an account of the operations of the Society for the Propagation of the Gospel in the year 1704. Mr. A. W. Franks presented a curious coloured print entitled "Plan du Fort vieux d'Asie des Dardanelles." Mr. H. Dillon exhibited an interesting red cornelian gem, of mediæval work, set in gold. The gem bore a lion passant. Around was the inscription IO SVI CI ENVEI DE AMI. Col. G. Weston exhibited the well-known Hunterston runic brooch, which has so often been described and discussed by Stephens, Wilson, and others. The Rev. W. Greenwell exhibited, by permission of the Dean and Chapter of Durham, a portrait of Mary Tudor. Mr. G. Scharf exhibited another portrait of her as Princess Mary, and a portrait of Mary Queen of Scots, both from the Broccas collection recently sold at Christie's. On all three pictures Mr. Scharf made some illustrative remarks, in which he brought under review the principal portraits of both the Maries. Dr. C. Bruce read a paper on the excavations last year at Chesters, on the station Cilurnum, which have brought to light a complete Roman forum.

LINNEAN SOCIETY.

May 24th.—At the Annual Meeting, Professor Allman, President, in the chair, there were presented by Mrs. J. J. Bennett three medals, memorials of Linnæus: one of silver, struck in 1746, given by Linnæus to Haller, in exchange for his portrait; one of gold, dated 1747, struck at the expense of Count Tessin; and a large silver one, designed by Lynberger, struck by command of the King of Sweden, in commemoration of the death of Linnæus, January 10, 1778. Mr. G. Gwyn Jeffries, treasurer, read his statement of the accounts of the Society for the year 1875. These showed its financial position to be very favourable, and indeed prosperous. The increase in the number of Fellows was very marked, and everything argued that the Society's retaining their reputation and usefulness as a scientific body. The President then delivered his anniversary address, choosing as a topic the department of Biology, treating of those remarkable forms, the borderland between vegetable and animal life. He began by allusion to De Bary's researches on Myxomycetes and its curious transformations; then referred in detail to Cienkowski's remarkable observations on Vampyrealla and the marine sarcodous organisms, Labyrinthuleæ. Dr. Archer's Chlamydomyxa, Haeckel's Myxastrum and Magosphærica, were each passed in review, and a comparison of all these forms entered into, with their peculiar phases and relations to each other. He observed that in them protoplasm was reduced to its simplest nature, evincing what might be considered vegetative or animal life, according to stage, &c. He summed up by regarding life as a property of protoplasm, but very different from Conscience and Will, or, indeed, any of the psychological phenomena. The following Fellows were elected into the Council:—Mr. J. G. Baker, Dr. W. P. Carpenter, Mr. H. Lee, Prof. W. K. Parker, and Mr. I. J. A. Salter, in room of the subjoined, who retired:—Messrs. W. T. T. Dyer, J. E. Harting, W. P. Hiern, J. J. Weir, and Dr. J. D. Hooker.

June 1st.—Prof. Allman, President, in the chair.—Photographs illustrating coffee cultivation in Ceylon and examples of tropical vegetation were shown by Mr. J. R. Jackson; and Mr. W. Bull exhibited specimens of the growing Liberian coffee, along with, for contrast, the common Arabian sort. The Rev. S. Henslow read a paper "On Floral Æstivations," in which he explained the origin of eight kinds, more particularly referring to the new term, "half-imbricate." This latter he applied to a large number of cases, ranging from perfectly regular to extremely irregular and zygomorphic flowers of the pea and snapdragon. The author added a note on a new theory of the cruciferous flower, based on a quinary type. He also disputed the tenability of Chorisis in the pairs of long stamens, regarding their occasional union as indicative of evolutionary advance, and not retrogression; as cohesion is a subsequent stage to freedom, except in the rare cases of atavism indicated by solution and dialysis. The justness of Pfeffer's view of the corolla of Primula being an outgrowth of the andrœcium he calls in question, giving several reasons in support of this adverse decision. A collection of ferns made in the interior of Madagascar, by Mr. W. Pool, formed the subject of a contribution by Mr. J. S. Baker. Of 114 species obtained, 15 prove new, and 28 are varieties of already known forms. Several of the ferns are thoroughly temperate types, and from certain indications Mr. Baker infers their localities to be damp and humid, excellently suited for such vegetation. Mr. F. Darwin read a paper "On the Glandular Bodies on *Acacia sphærocephala* and *Cecropia peltata*, serving as Food for Ants." The structures in question were discovered by Mr. Belt (Nicaragua), and subsequently further observations were made by Fritz Müller (Brazil), while Mr. Darwin has more particularly entered into their minute composition. In Acacia they are of two kinds: (*a*) nectar secreting glands, situate at the base of the petiole; (*b*) small, somewhat flattened, pearshaped bodies, which tip six or seven of the lowermost leaflets of the bipinnate leaves. In Cecropia cylindrical bodies are developed in flat cushions, at the base of the leaf stalk. Mr. Darwin shows the microscopic structure of all of these to be homologous in kind, cellular, protoplasmic, and containing oil globules. He infers, moreover, they bear a relation to the "serration-glands" of Reinke, in certain cases afterwards being converted into stores of nutriment, which undoubtedly the ants live on, and in their turn protect the trees from the ravages of the leaf-cutting ants. A notice of the Lichens of Madagascar, collected by Mr. W. Pool, by the Rev. J. M. Crombie, was taken as read. Prof. W. Thomson, of the Challenger Expedition, afterwards addressed the meeting, giving the results of two communications by him relative to Echinodermata obtained during the voyage.

ANTHROPOLOGICAL INSTITUTE.

June 13th.—Col. A. L. Fox, President, in the chair.—Prof. Busk described a collection of crania of natives of the New Hebrides, some of which had been sent to the President by Mrs. Goodenough, and others to the Royal College of Surgeons by Dr. Corrie. Seven were from the Island of Mallicollo, and three from that of Vanikoro. With respect to the former, he remarked that they were of especial interest as being the first, so far as he was aware, that had ever been brought to Europe from that locality; and also from their extraordinary form, due to the artificial depression of the forehead, a mode of deformation not hitherto recorded among the Melanesian race of New Guinea and the South Sea. The peculiar form of the head among the Mallicollese was noticed by Capt. Cook and the two Forsters, on the occasion of the discovery of the island in 1774. The skulls from Vanikoro, on the other hand, represented the normal form of the cranium in people of the same race. A paper by Mr. Ranken, "On the South Sea Islanders," was read by Mr. Brabrook. The author proposed that the name Mahori should be adopted to distinguish the light races of the Pacific from the Papuans or blacks. He adduced evidence to show the latter first occupied a large number of the islands, and that the lighter race arrived subsequently from the west, and formed a settlement in Samoa, when it is now well established that they spread in all directions, and in some instances mingled with the Papuans. He mentioned several points in which the Mahories differ essentially from the Malays, who, however, appear to be a cognate race. A short account of a visit paid to New Guinea by Mr. D'Albertis was communicated by Mr. A. W. Franks. Mr. Distant described some photographs of natives of Nicobar Islands.

STATISTICAL SOCIETY.

JUNE 20TH.—J. Heywood, Esq., President, in the chair.—The following gentlemen were elected Fellows:—Messrs. R. Vigers and J. Lornie.—A paper was read by the Right Hon. J. Stansfeld, M.P., "On the Validity of the Annual Government Statistics of the Operation of the Contagious Diseases Acts." In the discussion which ensued, Surgeon-General Balfour, Inspector-General Lawson, Sir H. Johnstone, Drs. Farr, Guy, Mouat, Drysdale and Nevins, and Mr. Miller, took part. A paper, "On the Physical Requirements of Factory Children," by Mr. C. Roberts, was laid on the table and accepted, there being no time to read or discuss it.

ZOOLOGICAL SOCIETY.

JUNE 6TH.—Dr. A. Günther, V.P., in the chair.—The Secretary read a report on the additions made to the Menagerie during May, and called attention to a fine specimen of the Tooth-billed Pigeon (*Didunculus strigirostris*); an example of the White-backed Trumpeter (*Psophia leucoptera*); a pair of Green-billed Curassows (*Crax viridirostris*), from Cartagena; a mother and three young of the Indian Fan-coloured Field-mouse (*Mus. cervicolor*), Hodgson (Jerdon, 'Mamm. of India.' p. 206); and a Blue or Soft-billed Duck (*Hymenolœmus malacorhynchus*), from New Zealand. He exhibited some specimens of a Land-crab from Ascension Island (*Geocarcinus lagostoma*), which had been presented to the Society by Dr. J. B. Drew, and read a note by Dr. Drew on their habits; also skins of a Male and Female of the new Pheasant from Borneo, lately described by Mr. Sharpe as *Lobiophasis Bulweri*. These birds had been obtained alive for the Zoological Society of Amsterdam, but the female only had lived to reach Amsterdam. Letters and papers were read: from Mr. J. H. Gurney, "On the Breeding of a Pair of the Polish Swan (*Cygnus immutabilis* of Yarrell)," and containing a description of the young birds,—from Dr. J. Von Haast, "On the Skeleton of *Ziphius Novæ Zealandiæ*, and on *Mesoplodon Floweri*,"—from Dr. G. E. Dobson, "On certain Peculiarities in the Structure of *Mystacina tuberculata*," which induced him to believe that this bat used its feet for purposes of locomotion on branches and leaves of trees,—by Mr. A. H. Garrod, part of a memoir on certain anatomical characters which bear upon the major divisions of the Passerine Birds,—from Mr. E. L. Layard, "On the Birds of the Navigators and Friendly Islands, with some Additions to the Ornithology of Fiji,"—by Mr. H. Adams and Mr. G. F. Angas, "On Five new Species of Land Shells from Madagascar, New Guinea, Central Australia, and the Solomon Islands."

June 20th.—Prof. Flower, F.R.S., V.P., in the chair.—The Secretary exhibited a drawing of a fine species of Fruit-Pigeon of the genus *Carpophaga*, living in the Society's Gardens, which apparently belonged to *C. paulina*, Bp. of Celebes and the Sulu Islands. Mr. Sclater read extracts from letters received from Signor L. M. D'Albertis, C.M.Z.S., and Dr. George Bennett, F.Z.S., respecting Mr. D'Albertis' proposed new expedition up the Fly River, New Guinea, and exhibited a small collection of Bird skins made at Yule Island and on the adjoining coast of New Guinea by the last-named naturalist. Dr. A. Günther, F.R.S., read a letter from Commr. W. E. Cookson, R.N., respecting the large Tortoises obtained in the Galapagos Islands which had been recently deposited in the Society's Gardens by Commr. Cookson. The living specimens had been obtained in Albemarle Island, those obtained in Abingdon Island having died before reaching this country. Dr. Günther added some remarks on the specimens of Tortoises and other animals collected by Commr. Cookson, and promised a more detailed account on a future occasion. Mr. G. E. Dobson read a paper on peculiar structures in the feet of certain species of mammals by which they are enabled to walk on smooth perpendicular surfaces, especially alluding to *Hyrax* and the Bats of the genus *Thyroptera*. A communication was read from Dr. J. S. Bowerbank, F.R.S., being the sixth part of his monograph of the Silicio-Fibrous Sponges. A communication was read from the Rev. O. P. Cambridge, C.M.Z.S., containing a catalogue of a collection of Spiders made in Egypt, with descriptions of new species and characters of a new genus. A communication was read from Mr. W. T. Blandford, containing remarks on the views of A. Von Pelzeln as to the connection of the Faunas of India and Africa, and on the Mammalian Faunas of Tibet. A second communication from Mr. W. T. Blandford contained remarks on some of the specific identifications in Dr. Gunther's second Report on collections of Indian Reptiles obtained by the British Museum. Mr. Howard Saunders read a paper on the *Sterninæ* or Terns, with descriptions of three new species, which he proposed to call *Sterna tibetana, Sterna eurygnatha and Gygis microrhyncha*. Dr. Cunningham, of the University of Edinburgh, described a young specimen of a Dolphin, caught off Great Grimsby, in September, 1875. After pointing out the great difficulty experienced in referring it to its proper place amongst the dolphins—this difficulty arising chiefly from the unsatisfactory and even unreliable descriptions which have been given in this country by former observers—he came to the conclusion that he was justified in referring it to *Delphinus albirostris*, the differences being in his opinion merely those of age. Mr. J. W. Clark read some notes on a Dolphin lately taken off the coast of Norfolk, which he was likewise induced to refer to the same species. A communication was read from Mr. R. B. Sharpe, F.Z.S., containing the description of an apparently new species of Owl from the Solomon Islands, which he proposed to call *Ninox solomonis*. Mr. A. H. Garrod read some notes on the anatomy of certain Parrots. Mr. H. E. Dresser read the description of a new species of Broad-billed Sandpiper, from North-Eastern Asia, to which he gave the name *Limicola sibirica*. A second communication from Mr. Dresser contained the description of a new species of *Tetraogallus*, discovered by Mr. Danford in the Cilician Taurus, which he proposed to call *T. tauricus*. Dr. A. Günther read some notes on a small collection of animals brought by Lieut. L. Cameron, C.B., from Angola. A communication was read from Lieut. R. Wardlaw Ramsay, giving the description of a fine new species of Nuthatch, from Karen-nee, which he proposed to call *Sitta magna*.

This meeting closes the present Session. There will be no more Scientific Meetings until the commencement of the next Session in November.

THE Annual Visitation of the Royal Observatory, Greenwich, took place on June 3rd last.

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APPLICATIONS FOR LETTERS PATENT.

On March 11th (*Continued from page* 98). F. E. B. Beaumont and W. Pilkington. Roller skates.—A. Ford. Method of constructing the flooring of skating rinks.—H. E. Jones. Regulating and correcting alterations in the pressure of gas flowing through street mains.—H. Hughes. Tram or road locomotives.—J. F. Burke, J. M. Burke, and E. M. Browne. Switches or junction points of railways and tramways.—W. Anderson. Arrangement of apparatus for working bilge pumps (com.)—J. Brierly, F. W. Brierly, and W. W. Brierly. Railway signals.—H. E. Newton. Preparation of colours or pigments which by vitrification are rendered permanent (com.)—T. H. Wood and T. Cross. Skates for rinks.—W. Dummer. Manufacture of waterproof compositions.—A. Miller. Construction of pump or fluid drawing and forcing apparatus.—G. F. Redfern. Machinery or apparatus for shaping or planing screw-nuts, washers, bolt-heads, and for other similar purposes (com.)—S. Emsley and S. Smith. Doubling and twisting, and apparatus connected therewith.—G. E. Saville. Gas scrubber or washer.—N. W. Lobb. Preparation of farinaceous food and other alimentary substances.—F. W. Monck. Apparatus for copying manuscripts and drawings with an instrument combined to the same for affixing postage and other adhesive stamps and labels.—P. S. Justice. Cases or boxes to be made of metal, wood, or any suitable plastic material to serve the purpose of a covering for hand sewing machine and other small objects liable to be injured by exposure to dust.—J. Clubb. Apparatus for examining into casks and other partially closed vessels or receptacles to ascertain their condition.—W. R. Lake. Knitting machinery (com.)—W. R Lake. Apparatus for ventilating coal mines, and for similar purposes (com.)—W. Smith. Governors.

On March 13th.—1082 to 1097.—W. Shorrock. Combined heald springs for weaving fancy work of every description.—P. F. Tarbutt. Roller skates.—E. Alexander and D. T. Lansley. Boilers.—T. Titley. Screw jacks.—E. C. Ring. Construction of roller and other skates.—J. Gowans. Numbering, stamping, and embossing machines.—W. Simons. Steam ferry boats or vessels and other vessels.—H. Simpson. Fastenings of leggings, travelling bags, and other similar articles.—J. S. Gisborne. Apparatus for transmitting and receiving signals and orders on messages.—E. P. Alexander. Pocket alarums or alarum watches (com.)—T. Black. Equilibrium or suspended cabins for ships or navigable vessels.—W. Chaloner, J. Chaloner, and T. Chaloner. Steam-traps.—C. Cousins and J. Brown. Apparatus for locking facing points upon lines of railway.—Sir W. Thomson and F. Jenkin. Telegraphic apparatus.—H. Smith. Casings of millstones, and the passages and stive room connected therewith.—W. Moseley. Signalling apparatus for use on ships, and for colliery, railway, and other like purposes.

On March 14th.—1098 to 1107.—B. S. Weston. Roller skates.—H. S. Eyre. Screw propellers.—G. Conway. Roller or rink skates.—C. M. Bate. Roller skates, applicable to other purposes.—H. A. Hardinge. Skates.—J. Neale. Production of sulphuric acid (com).—R. F. Mason. Refrigerating or cooling apparatus for the preservation of meat and other perishable substances, and for other purposes.—W. R. Lake. Pegging machinery and wire pegs to be used in the manufacture of boots and shoes (com.) (Complete specification.)—C. T. Ashmore. Baking powders (com.)—E. G. Burton. Producing telegraphic messages at a very rapid rate, printed in bold type letters.

On March 15th.—1108 to 1125.—M. P. W. Boulton. Apparatus for producing heat by the combustion of inflammable gases or vapours, and for generating the latter.—J. Pike. Apparatus for checking the amounts of fares collected by the conductors of omnibuses and tramway cars. R. Howell. Self-feeding penholders.—F. G. Bone. Steam-boilers.—E. G. C. Bomford and H. J. H. King. Apparatus to be applied to reaping machines, and relating to the binding of the crop cut by such machines.—A. McLaren. Steam traps or apparatus for automatically discharging water or other liquid from pipes or vessels containing steam.—J. H. Walsh. Roller skates.—E. de Zuccato. Producing fac-simile copies of writings, drawings, and delineations.—E. Bradley, H. Bradley, and W. Sunderland. Means or apparatus for economising fuel and for the consumption of smoke.—E. Korting. Apparatus for forcing and raising liquids, and for other useful purposes.—J. Brown, W. Dean, and A. Orrah. Apparatus for cutting cotton, woollen, silk, or other pile fabrics.—J. Colborne and T. C. B. St. George. Construction of engine for obtaining and applying motive power.—D. Williams, J. Jenkins, J. Jones, and D. Thomas. Means for utilizing old waste cast and wrought iron annealing pots used in tin plate works.—C. Muratori. Manufacture of paint.—E. Corani. Combined boot blacking stool and seat (com.)—A. M. Clark. Screw-wrenches (com.)—F. Wirth. Pianos (com.)—J. F. Foss. Carding machines.

On March 16th.—1126 to 1146.—H. J. Haddan. Skate attachments (com.) (Complete specification.)—J. Santy, B. Santy, and G. Hiscox. New hand power separating machine for grain and seeds.—R. M. Lowne. Anemometers or instruments for measuring the velocity of currents of air or gas.—W. Bishop. Processes or modes of chemically cleaning or freeing wool or woollen textures from vegetable matters, to be employed more especially previous to or in connection with the process of dyeing.—W. Spour. Ratchet braces.—E. Edwards. Roller skates.—T. Dobson. Safety apparatus for miners' cages, hoists, and pit working.—H. P. Holt. Motive-power engines.—H. Woolfe. Construction of washing machines.—E. Japy. Improved cock, intended for the computation of glasses of beer, wine, or other beverages or liquids in breweries, coffee-houses, public houses, &c. (com.)—H. B. Hanna. Construction of ships of war and coast defence vessels, partly applicable to other ships, boats, and vessels.—W. Morgan-Brown. Sewing machines (com.)—H. E. Newton. Improved construction of apparatus for obtaining extracts or infusions from vegetable and other substances (com.)—Carl Pieper. Governors for steam-engines, water-wheels, turbides, and other motors (com.)—W. R. Lake. Devices for closing and fastening articles of wearing apparel, partly applicable to other purposes (com.)—T. J. Waters. Machinery for the manufacture of wood-screws.—W. L. Wise. Improved lifting jack for railway purposes (com.)—A. M. Clark. Manufacture of metallic laces or trimmings used for military and other purposes (com.)—A. M. Clark. Feeding apparatus for carding and other machines (com.)—A. M. Clark. Ocean station for submarine telegraphs (com.)—A. M. Clark. Hay, straw, peat, and ditching knife (com.)

On March 17th.—1147 to 1161.—G. Keel. Roller skates.—A. L. Henderson. Production of ceramic photographs.—N. Wells. Mariner's compasses.—Jas. Hollingworth and Jos. Hollingworth. Looms for weaving.—W. Hopps. Means or apparatus for the compression of oil seeds to extract oil therefrom and produce cakes, also applicable in the compression of other seeds or matters for the production of cakes or blocks.—M. J. Roberts. Safety valves.—J. Liston. Apparatus for making clay pipe rolls, for moulding or shaping the same into tobacco pipes, and for finishing such pipes.—D. Hawkesworth and H. Colford. Apparatus particularly applicable as a spark arrester for locomotive smoke stacks and other flues or chimneys. (Complete specification).—J. F. L. Clare and G. L. Campbell. Game of skill, and implements or apparatus for playing the same.—G. T. Bousfield. Hand rests for pianofortes (com.)—S. S. Lewis. Manufacture of soap.—F. H. Lloyd, C. Faulkner, W. E. Lloyd, and W. H. Lloyd. Manufacture of steel and iron tubes, and machinery or apparatus employed in the manufacture of steel and iron and other metallic tubes.—G. B. Northcote. Apparatus for charging, turning, and capping cartridges for breech-loading fire-arms.—D. Mills. Sewing and channelling machinery for the manufacture of boots and shoes.—J. W. Dennison. Paving for roads, ways, and other places.

On March 18th.—1162 to 1181.—De La M. Moore. Steam boilers.—H. M. R. Barton. Brake for vehicles.—W. B. Smith and J. Starley. Roller and other skates, partly applicable to sledges and other carriages.—W. Griffin. Apparatus for collecting and recording money or tickets and other similar purposes.—J. S. Thompson and W. Thompson. Fence, gate, and other posts or standards.—E. S. Norcombe. Modes of and apparatus for setting or adjusting and for threading the needles of sewing machines.—J. Marshall. Thrashing machines and apparatus connected therewith.—J. Shaw. Steam engines.—E. Corbett, senr., and E. Corbett, junr. Apparatus for locking nuts on screw bolts, applicable to the permanent way of railways and other purposes.—R. J. Hutchings. Machinery or apparatus for heating, pickling, and swilling metal plates.—G. Archbold, W. J. Cooper, and J. A. Wanklyn. Distilling and rectifying spirits.—W. O. Carter. Method of and apparatus for cutting or quarrying slate, stone, or other like substances.—W. Mather. Apparatus for steaming and ageing printed fabrics.—J. G. Wilson. Screw and other couplings of railway carriages, waggons, and other vehicles (com.)—H. Kenyon. Producing oxyde and chloride of zinc.—G. H. Johnson and T. Johnson. Colliery tubs.—H. Collot. Solitaires.—P. J. Davies. Closet and other valves and apparatus for cleansing, watering, controlling, regulating, and arresting the flow or discharge of water and preventing waste thereof.—G. Clark. Construction of and appliances for roller skates.—A. M. Clark. Forging or moulding articles in metal and machinery and appliances therefor (com.)

On March 20th.—1182 to 1197.—J. Reidy. Pick or pickaxe for engineering, excavating, mining, and other purposes.—R. Milburn and H. Jackson. Apparatus for drying or concentrating sewage deposit, excreta, blood manure, peat, and other matters.—W. Foster. Means or apparatus for checking the receipts or payments of monies in shops and other places.—C. M. Maclean. Roller or wheel skates and the rollers or wheels used therewith, also applicable to other purposes.—W. Morgan-Brown. Preserving and hardening wood or timber (com.)—J. E. Simpson and C. Cross. Manufacture of cloth known as "Indian kutar," and of other cloths of a similar nature, and apparatus used in such manufacture.—J. Runnett and W. W. Finch. "Self-feeder" for machines used in the manufacture of cut nails or tacks.—G. Bray. Machinery or apparatus for cutting, turning, or shaping wood.—H. Fleming and E. Sandeven. Bottles and jars and stoppers for bottles and jars.—J. J. Lundy. Tins or receptacles for preserved food and other articles or substances.—C. N. May. Steam boilers.—H. Speller. Tip for billiard and bagatelle cues, and method for fastening and fixing the same.—W. R. Lake. Manufacture of nickel and its alloys from its oxides or silicates or other salts (com.)—W. Usher and H. Usher. Roller skates.—A. M. Clark. Air and waterproof fabrics (com.)—J. P. Onderdonk. Methods of making up the coverings of umbrellas or parasols, and attaching the same to frames. (Complete specification.)

On March 21st.—1198 to 1210.—P. Nolet. New method of working telegraphic lines, and especially submarine cables and underground lines.—O. Brown. Signalling between parts of railway trains.—C. Sheppard. Apparatus for washing and purifying coal, ashes, and other substances.—H. W. Putnam. Wire bending and twisting machines, for baleties and similar articles.—J. M. Baker. Horse-hoes.—J. Purchase. Treatment of certain plants to obtain fibres and other products therefrom.—R. Saunders. Method of and apparatus and accessories for mooring or anchoring navigable vessels or other floating structures, partly applicable to various other useful purposes on board ship or other floating structures and piers.—C. Garside. Rotatory engines, applicable also to exhausting, forcing, or raising and measuring fluids.—T. Rickett. Hydraulic draw benches for drawing steel and other tubes.—O. Gössell. Reducing furnaces and the mode of working the same (com.)—W. Mort. Refrigerating and purifying air in rooms or spaces, in refrigerating liquids and other substances, and restoring the frigerific salts employed in such refrigeration to their solid state (com.)—L. B. Bertram. Wheel or roller skates.—W. R. Lake. Furnace for puddling iron and steel and similar operations (com.)

On March 22nd.—1211 to 1232.—A. Stevenson. Skating rinks.—J. Rooke. Roller skates.—W. Gardiner. Roller skates.—J. Conlong. Steam traps.—S. Wekey. Machinery and apparatus for the washing of clothes and other textile fabrics.—R. Nicholls. Taking the true bearing, line, and dimension of the width of the human foot and bony structure of the same by a new, novel, and accurate way.—J. Mathers. Atmospheric carriage.—J. Horrocks. Construction of steam boilers.—G. Hudson. Tricycle.—E. Timmins. Furnaces or apparatus for heating, roasting, and calcining ores, alkalies, and other substances.—G. Lowry. Roller or rink skates.—J. Ditchfield. Machinery for doubling and measuring cloth and other fabrics.—G. Porter, jun. Glass, opal, and other shades and reflectors, and method of supporting and affixing them unto gas and oil burners.—A. Pope. Motive-power engines for propelling vessels and for other purposes.—J. Strong, jun., and A. Strong. Furnaces and boilers.—W. R. Lake. Sewing-machines, more especially designed for straw-braid work (com.)—J. Dimelow. Apparatus for feeding what are commonly called "cut-nail machines."—W. Hillman. Construction of roller skates.—J. H. Johnson. Obtaining colouring matters suitable for dyeing and printing (com.)—J. McJannet. Ball cock.—J. Oxley. Rails and fastenings for tramways and other similar purposes.—E. Wilson. Pumps and other valves, and the securing of the same and parts connected therewith in their chambers or boxes.

On March 23rd.—1233 to 1250.—T. Unsworth. Laying the fibre of yarns of all descriptions, in spinning, doubling, and twisting and dispensing with the necessity of gasing.—J. F. G. Renette. Mounting "fore-parts" of breech-loading arms. F. Clarke. Waggonettes.—T. Cook. Apparatus or appliances for compressing chlorides of soda and potassa.—A. M. Clark. Machinery for spinning wool, cotton, and other fibrous substances (com.) (Complete specification.)—E. G. Brewer. Construction or apparatus and appliances for enabling persons to enter places filled with smoke (com.) (Complete specification.) W. Morgan-Brown. Braces or suspenders (com.)—T. White, J. White, and M. White. Winding machines.—J. P. Clabrough. Manufacture of certain kinds of gun and pistol barrels and machinery or apparatus employed in the said manufacture.—W. H. Nevill. Treatment of cinders from iron puddling and heating furnaces.—I. B. Harris. Mode of attaching indiarubber to the tyres of wheels and the surfaces of pulleys and cylinders.—F. Ley. Apparatus for locking and fastening nuts on fish-plates and other bolts.—S. Hjerleid. Screw coal feeder, and combination of moveable grate with the same, also the application or the screw in charging chemicals, to prevent escape of gases, and other ways, and the combination of the same with patent rotary furnaces.—R. H. Williams. Apparatus for preventing explosion and spontaneous combustion in coal on board ship.—C. A. Watteeuw. Rotatory steam-power engine.—D. Smith and I. Bailey. Machinery for combing wool and other fibrous substances.—J. Wood. Railway couplings.—H. Dickinson. Ornamentation of wood surfaces.

On March 24th.—1251 to 1275.—L. Person. Bag locks.—M. Burke. Roller skates.—J. Middlehurst. Clay pipes for smoking.—J. Brierly and H. McCraith. Bottles and stoppers for same.—B. Hunt. Setting and distributing types (com.) (Complete specification.)—W. R. Lake. Combustible compounds and apparatus for the production of gas for domestic, manufacturing, military, and other purposes (com.)—H. J. Haddan. Attachment of rudders to ships and other vessels (com.) (Complete specification.)—J. E. Pratt. Silvering mirrors, plate, and other glass.—J. E. Pratt. Preparation of glass for silvering and compounds therefor.—A. Collingridge. Skates travelling by means of wheels or rolling bodies of globular form.—R. Souttar. Permanent way of tramways, partly applicable to other purposes.—W. P. Thompson. Skates (com.)—J. W. Wood and W. H. Shakespear. Skates.—P. Lawrence. Gas and other stoves.—J. Macintosh. Raising sunken vessels.—E. Mayer. Temporary repair of shafts, poles, axletrees, and springs of vehicles.—C. R. Stevens. Roller skates.—T. Clarke, the younger. Rails and chairs for tramways and other similar purposes.—W. Sutherland. Staining, ornamenting, and decorating wood, metal, and other surfaces.—E. M. Knight. Bottles, and method of and appliances for stoppering same.—G. Hookham. Metallic lines for suspending pictures and window sashes and for other like purposes, and machinery for manufacture of the said metallic lines.—H. Walker. Fastenings for solitaires, sleeve links, collar and other studs, gloves, bags, and other articles.—A. Pye-Smith, O. W. White, and R. Elliot. Stable fittings and paving.—W. R. Lake. Machine for varnishing the interior of metallic cartridge shells or cases (com.) (Complete specification.) — W. Lockwood. Buffer and bearing springs for railway carriages and waggons.

On March 25th.—1276 to 1298.—T. Walker and J. Walker. Cemented leather for "insoles" and other purposes.—J. E. A. Gwynne and H. Collinson. Retort lids, manhole covers, valves, sluices, and such like apparatus.—Dr. K. Reimer. Process to obtain aldehyds from phenols by chloroform or chloral and alkalies.—J. C. Sellars. Apparatus or appliances for moulding artificial stone for building purposes. J. Bury. Revolving ventilating and chimney cowls.—B. Barker. Tramways.—J. H. Johnson. Vibrating metallic portions of musical instruments and other vibrating metallic articles (com.) R. Morton. Apparatus for whipping, beating, or churning liquid or semi-liquid substances.—J. Watts. Skating rinks.—A. Boulton. Means or apparatus employed in the manufacture of tacks or cut nails.—A. K. Robinson. Cooking ranges and stoves.—C. E. R. Isherwood. Self-acting dampers for steam boilers and appliances connected therewith.—W. R. Carr and J. Urwin. Brick-making machinery.—T. Rule. Bottles for containing aërated or other liquids.—W. Hemsley. Roller skates.—J. Malings. Cricket balls.—F. W. Ticehurst. Packing gunpowder for carriage or transit.—E. P. H. Vaughan, F.C.S. Manufacturing and refining cane, beet-root, and other crystallizable sugars (com.)—W. Coppin. Diving helmets and dresses, and apparatus used therewith.—J. A. Bosworth. Machinery for moulding bricks and such like articles.—R. Mills. Hydraulic cranes.—P. Hooker and E. Wright. Attachment for pole chains or straps and traces.—G. Dubern. Telegrapic instruments.—T. Hyatt. Buildings, building constructions, and building materials.

On March 27th.—1300 to 1318.—C. Peiper. Printing on rough and uneven surfaces (com.) T. Pollock. Leno gauze or muslin curtain.—W. T. Carpenter. Apparatus used in the manufacture of gas.—L. de Bejar y O'Lawlor and N. A. Calvo. Electric telegraphy.—D. W. Van Rennes. Caloric pump and motive engine.—C. G. Bennett. Roller skates.—C. Ford. Preparing all kinds of clay by machinery for all kinds of potting, either in earthenware or china.—J. Holt. Sack hoist.—T. W. Roberts. Ventilating of mines.—C. Tayler. Floor cloth and such like fabrics.—J. Hocking, jun. Pumps for raising water from mines and for other such like purposes.—W. Garton. Brewing and a preparation of a material to be employed therein.—B. Hunt. Burning of lime or cement and apparatus to be used therein (com.) (Complete specification.)—A. W. Franklin. Dress suspenders.—J. Magaud-Charf. Manufacturing corks.—A. M. Clark. Feeding bottles (com.)—E. Turner. Means for lighting illuminating gas (com.)—F. B. Hill and T. M. Nishigawa. Engines to be operated by the expansive force of ammonia, ether, or other liquifiable gas.—F. R. Conder. Machinery for moving fluids, and machines to be moved by fluids, and the apparatus employed therein.

On March 28th.—1319 to 1330.—J. Smith. Connecting the rods for the working of railway signals, points, and crossings, or other like connections.—A. Billet. Printing telegraph apparatus.—T. H. Cobley and .. A. Dixon. Treatment of copper pyrites and other ores of copper. — W. H. Carter. Treatment and preservation of animal substances or products.—W. Garton. Brewing and manufacture of materials to be employed therein.—W. F. Tindell. Manufacture of boxes and similar articles from paper pulp (com.)—J. Carpenter. Skates, applicable to ice skates or roller skates.—R. Smith. Keys for locks.—W. Morgan-Brown. Elastic seams or gorings for shoes, gloves, or other articles.—A. Maw and J. W. Hartley. Screw or fly presses.—C. Price and W. Harris. Breech-loading fire-arms.—Jno. Swinney, T. Swinney, and Jas. Swinney. Machinery or apparatus employed in the manufacture of bricks.

On March 29th.—1331 to 1355.—J. Richards. Machinery for making barrels and other vessels of wood.—J. H. Kenyon and J. Kenyon. Apparatus for extinguishing fire.—M. Friedeberg. Manufacture of ornamental lace, and the means employed in the manufacture thereof.—A. Cooper. Preparation of counter-irritants in lieu of ordinary mustard plaisters, mustard paper, or other sinapisms.—A. W. Gillman and S. Spencer. Means or apparatus employed in bottling beer and other liquids.—R. Hepper. Agricultural machinery.—F. N. Mackay. Manufacture of ice, applicable for skating and curling upon, and apparatus therefore.—N. D. Griffin. Manufacture of certain descriptions of shovels or like implements.—Sir W. Thomson. Mariners' compass and means for ascertaining and correcting its errors.—J. T. Bintley. Cases for watches and clocks.—P. Lloyd. Fences.—G. A. Keyworth, F.C.S. Preparation of paper and such like materials to be employed for disinfecting and deodorizing purposes.—G. E. Turner. Wheel or roller skates and constructing the wheels or rollers of the same, also the mode of attaching and adjusting the skates on or to the boots or shoes on the feet of the wearer, which attachment and adjustment are also applicable to skates used on ice.—E. de Pass. Electro-engraving machines (com.)—S. W. Worssam. Sawing machines.—M. Macdermott and G. W. Elliott. Wedging apparatus for breaking away coal or other mineral or material out of the solid without the use of explosives. (Complete specification.)—E. H. Stutter, J. Stubbs, and J. Corrigan. Apparatus for threading or passing weft yarns or threads through the eyes of shuttles used in looms for weaving.—H. T. Palmer. Self-acting mules and mule doublers used for spinning and doubling cotton, wool, silk, and other fibrous materials.—T. Mills. Mode or method of extinguishing fires.—W. Scott. Construction of roller skates.—A. V. Newton. Apparatus for assorting coin (com.)—J. H. Johnson. Injectors (com.)—H. C. Tucker. Means of "hanging" or supporting window-sashes, applicable also to other similar purposes.—A. M. Clark. Manufacture of machine bands, cables, cordage, and other fabrics (com.)—F. Hille. Treating sewage.

On March 30th.—1356 to 1382.—N. Marshall. Ice and rink skates.—H. Lacey. Apparatus for ventilating confined spaces, which apparatus is also applicable for the cure of smoky chimneys. A. Lloyd. Window-sash fastener.—J. Ravenscroft. Securing and locking tiles used for mural decorations and other purposes to the surfaces to which they are applied.—G. G. Bussey. Roller skates.—A. M. Clark. Device for expanding hoofs (com.)—A. M. Clark. Apparatus for use in dental operations (com.)—J. Fletcher. Machinery for forging nuts, bolts, rivets, and spikes.—A. Paget. Stands and receivers of tipping basins.—R. A. Gibbons. Manufacture of casks and apparatus therefor.—F. Applegath. Weirs or annicuts, and sluices therefor.—W. C. Pellatt. Apparatus for covering tablets of any desired form or substance with metal foil, paper, or other material.—J. Riley. Manufacture of soda ash and other salts, and furnaces therefor, applicable also in part to other purposes.—R. McL. Young. Sewing machines.—J. Astley and F. Davies. Machinery for knitting healds.—J. Ward. Looms for weaving.—T. Stevenson. Drain pipes.—P. Jensen. Construction of steam boilers (com.)—T. J. Smith. Telegraphic receiving and recording apparatus (com.)—E. Barnett and J. W. Nelson. Roller skates.—W. Ireland. Instrument for indictating or ascertaining the relative speed of revolving surfaces, the same being especially applicable for ascertaining draught in preparing or spinning machinery, and for measuring the delivery or uptake of slivers or yarns.—J. McInnes. Apparatus for actuating continuous brakes by compressed air, partly applicable to continuous brakes otherwise operated.—W. McFarlane and A. McPherson. Manufacture of leno curtains, blinds, and similar fabrics.—H. Green and B. Sykes. Roller skates.—W. A. Gibbs. Machinery and apparatus for drying.—A. A. Pope. Air pistols (com.) (Complete specification.)—A. A. Pope. Air guns or pistols. (Complete specification.)

On March 31st.—1383 to 1403.—W. Morgan-Brown. Playing cards (com.)—J. A. Mays. Roller and other skates.—H. Beresford and J. Mullin. Construction of mules for spinning cotton and other fibrous substances.—H. Sharp. Apparatus for moulding pipes, segmental and invert blocks for sewers, paving-blocks, moulded courses, and other articles in concrete.—R. Hall. Steam cultivating engines, implements, and appliances connected therewith.—J. Clough. Machinery for combing wool and other fibrous substances.—J. G. Tongue. Hose and pipe nozzles for extinguishing fires, &c. (com.)—F. E. B. Beaumont and J. Foster. Percussive rock drills.—M. J. Roberts. Fishplate for rails or means of connecting the ends of rails together.—J. Monjot. Looms for weaving.—J. J. Nicholl. Manufacture of metallic hooks for suspending articles of clothing and other objects, and means of attaching the same to their supports.—A. P. Price. Wheels or rollers for skates.—S. Chandler, jun., and J. Chandler. Railway appliances.—J. Pickering. Lubricators.—J. L. Taylor and R. Ramsden. Machinery for spinning and doubling cotton, silk, worsted, woollen, linen, and other fibrous materials.—A. M. Clark. Refractory material or composition for lining puddling and other furnaces and for other uses (com.)—T. Kay. Money tills.—H. J. Haddan. Machinery for dressing tampico and bristles (com.)—H. J. Haddan. Grain binders (com.)—S. C. Lister. Combing.—G. H. Marshall. Apparatus for working punkahs.

On April 1st.—1404 to 1419.—W. Poole. Cans or receptacles for containing and conveying milk.—A. Allan, jun. Pressure and vacuum gauges.—F. D. Nuttall. Tank furnaces for the manufacture of glass bottles.—A. M. Clark. Veneer-cutting machines (com.)—E. Tyer. Pneumatic brake apparatus for railway trains. J. Hall and W. Hall. Roller skates.—G. Knowles, jun. Mules for spinning.—H. J. Cole. Siphon taps for aërated liquid bottles.—E. Maden. Machinery for compressing air. H. Bezer. Rloler skates.—E. T. Periam. Screw bolts. J. Stenner. Construction of corn and manure drills. W. R. Douglas. Apparatus for raising and lowering boats.—T. Vickers. Travelling bags.—H. B. Binko. Bottle with moveable bottom.—T. Lane. Manufacture of fuel.

On April 3rd.—1420 to 1429.—J. Hall. Draught and dust excluder.—T. H. Jones and G. Ellis. Machines for dressing slates.—E. Keighley. Apparatus for singeing woven fabrics and other fibrous substances.—F. F. Seeland. Treadles for foot or hand power.—J. D. Brunton and G. Brunton. Tunnelling machinery.—A. M. Clark. Machinery for making cakes (com.)—J. M. Holmes. Gas stoves or gas apparatus for heating and cooking (com.)—E. G. Johnson. Pencil-cases, pen-holders, combined pen and pencil-cases, tooth-picks, surgical instruments, and other similar articles.—J. Dowding Paving of streets, roads, and elsewhere.—J. Howard and E. T. Bousfield. Tilling implements.

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